

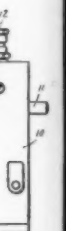
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12,000 HOURS PER .001" WEAR

12,000 HOURS per .001" liner wear in an Iowa power plant.*

25% LESS cylinder wear in a Texas power plant.*

"INFINITESIMAL wear" in a Maryland Textile Mill.*

*Name on request.



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FOR ALL DIESEL ENGINES

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

DIESEL PROGRESS, for December, 1942. Volume VIII, Number 12. DIESEL PROGRESS is published monthly by Diesel Engines, Inc., 2 West Forty-fifth Street, New York, N. Y. Rex W. Wadman, President. Acceptance under the Act of June 5, 1934, at East Stroudsburg, Pa., authorized March 27, 1940. Subscription rates: \$5.00 per year, single copy, 50c.

**DIESEL
ENGINE
PROGRESS**

REX W. WADMAN
Editor and Publisher
HEYWORTH CAMPBELL
Art Director

FRONT COVER ILLUSTRATION: A Caterpillar Diesel Tractor hauling ore from Cornucopia Gold Mines, Oregon to the mill—a distance of $1\frac{1}{2}$ miles with a 1,200 ft. drop in elevation. On the return trip, this outfit hauls lumber and supplies back to the mine.

TABLE OF CONTENTS ILLUSTRATION: More Power for the Navy—A Diesel being loaded for shipment from Midwest plant. O.E.M. Photograph by Palmer.

DIESEL PROGRESS for December, 1942, Vol. VIII, No. 1. Published monthly by Diesel Engines, Inc., 2 West 45th Street, New York, N. Y. Tel MUrray Hill 2-7333. Subscription rates, \$5.00 per year; 50c per copy.

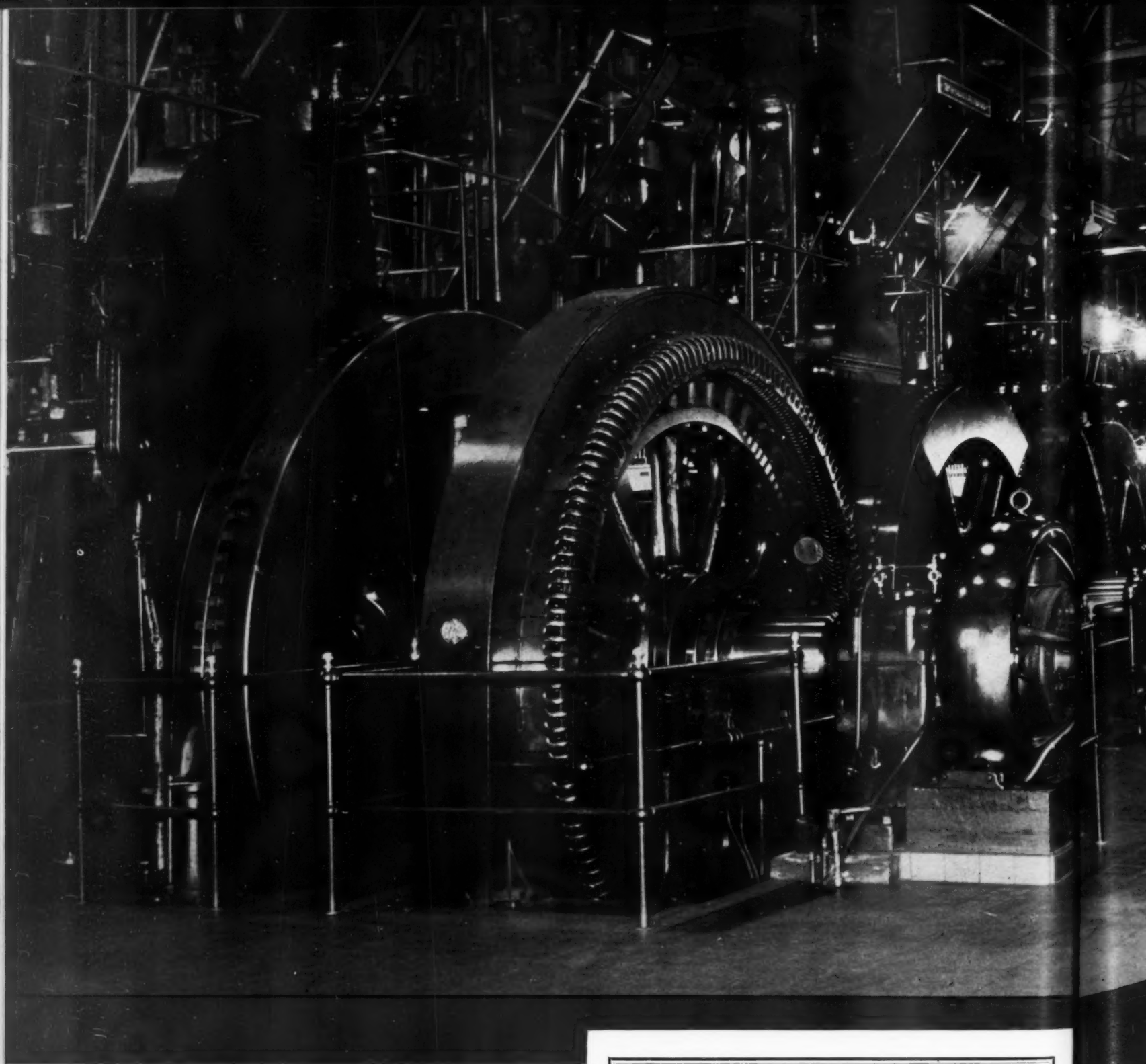
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ONE of the nation's largest Diesel generating plants, the Rockville Centre, New York, municipal plant, has maintained its position in the front rank with the installation of a new 3,000 hp. Nordberg Diesel. This giant engine, put into service in September, 1942, brings the total capacity of the plant to 12,500 horsepower. Rockville Centre is noted among engineers not merely for its size, but for the planned efficiency of its operation. It is noted equally among municipal officials for an impressive record of financial success, based solidly

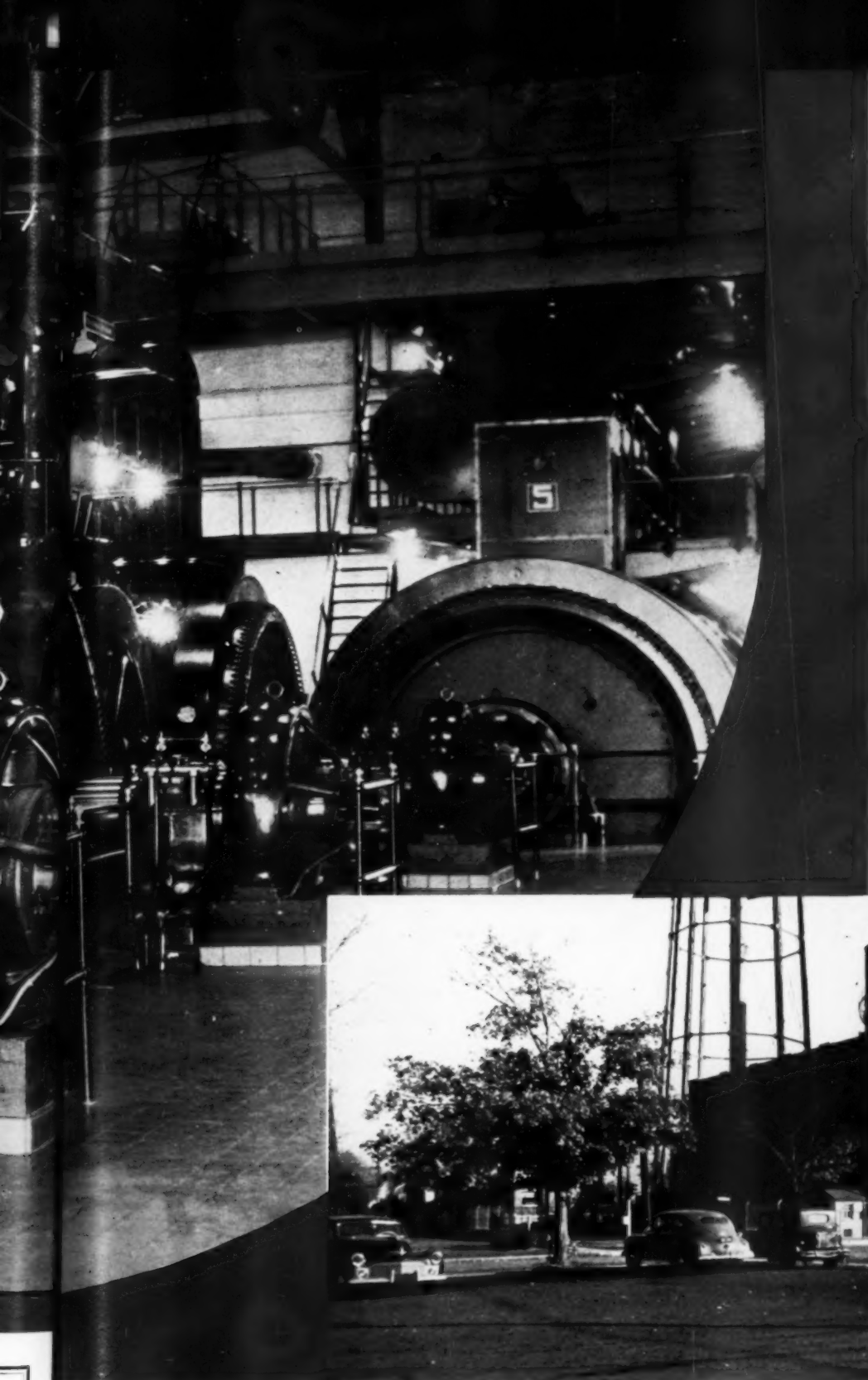
Above: Partial view of the Rockville Centre municipal plant engine room, showing three 1250 hp. units, left, and one 2865 hp. unit, rear, all McIntosh & Seymour Diesels. Right: The Rockville Centre plant is one of the largest Diesel plants in this Country, having a total of 12,500 horsepower.

TABLE I

Year	Kwh. Produced	Fuel Consumed (Gals.)	Kwh. per Gal. Fuel	Peak Load
Mar. 1st				
1929-30	5,831,000	552,800	10.55	2140
1930-31	7,391,500	678,126	10.89	2520
1931-32	8,572,600	778,392	11.01	2900
1932-33	9,281,200	821,359	11.29	2920
1933-34	9,956,100	837,686	11.88	3020
1934-35	10,537,400	877,543	12.01	3125
1935-36	11,377,000	940,730	12.09	3440
1936-37	12,365,400	1,028,507	12.02	3600
1937-38	13,229,100	1,095,073	12.08	4050
1938-39	14,151,000	1,140,644	12.41	4300
1939-40	15,259,500	1,220,756	12.92	4500
1940-41	15,779,500	1,271,420	12.41	4850
1941-42	16,334,700	1,300,522	12.56	4950
Total	150,066,000	12,543,567	11.96 average	4950 peak

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AT

ROCKVILLE CENTRE

By WM. H. GOTTLIEB



on Diesel economy. The new engine seems destined to carry the plant to new heights of economical achievement.

Rockville Centre was a pioneer in municipal power production, putting a steam plant into operation back in 1898. When increasing population outgrew this prime mover, the city turned to Diesels, installing in 1928 an 825 hp. and two 1,700 hp. McIntosh & Seymour engines. The plant developed steadily, with a third 1250 hp. unit added in 1930, a 2865 hp. unit

in 1933, and a second 2865 hp. engine in 1937. Up to this point, all the engines were slow-speed, 4-cycle, air-injection McIntosh & Seymour Diesels, all direct-connected to General Electric generators. This vast expansion was essential if the plant was to keep pace with the growing load and maintain a reasonable reserve capacity. Production for the first full year of Diesel operation, the fiscal year 1929-30, was 5,831,000 kwh. and the peak was 2,140 kw. In the year 1941-42, production was 16,334,700 kwh. and the peak was 4,950 kw. In thirteen

years, Rockville Centre's Diesels have produced more than 150,000,000 kwh. Table I gives annual figures on kwh. generated, fuel consumption and peak loads. It will be seen that fuel economy for the air-injection engines has been excellent, rising from an initial 10.55 kwh. per gal. of fuel to a high point of 12.92. For eight years, the return for fuel has been above 12 kwh. per gallon.

Close study of the rising load curve made it evident to Rockville Centre engineers early in

1941 that further plant expansion was necessary. The officials of this power system investigated the engines available in the desired size to determine which would best meet requirements. It was decided to install a mechanical-injection Diesel to take advantage of better fuel economy, but the engineers wished to tie the new unit into the existing fuel system and continue to use the heavy No. 5 fuel consumed by the air-injection engines. Dimensions of the engine were another factor, for it was desired to put the new unit in the space occupied by the original 825 hp. engine so that it would not be necessary to enlarge the building. At the same time, success with slow speed Diesels dictated a preference for a reasonably low rpm.

The result of this study was the installation of a 7-cylinder, 21½ in. by 31 in., 2-cycle mechanical-injection Nordberg Diesel, rated at 3000 bhp. at 225 rpm. It drives directly a 2000 kw., 2500 kva., 80% pf., 2 phase, 60-cycle, 2300 volt Westinghouse generator with direct-connected 30 kw., 125 volt exciter. Initial experience with the new engine has fulfilled all expectations. Under actual operating conditions, it has produced 14 kwh. per gal. of fuel at 75 percent load and near 14.5 kwh. per gal. at full load.

Rockville Centre's operating schedule virtually never requires an engine to run at less than 70 percent of rated capacity. The mechanical-injection Diesel is burning the same fuel used for the air-injection units. This No. 5, high grade, top crude oil has the following specifications: Gravity (16F, API), 21.1; Viscosity (SSU, 100F), 78 sec.; Conradson carbon, 0.59%; Ash, none; Flash Point (Cleveland), 205F; Sulphur, 0.24%; B.t.u. per lb., 19,090.

The plant is just two and a half miles from the tidewater terminal of the Colonial Beacon Oil Co. and this fuel was obtainable in normal times for only four cents a gallon. The current

price is five cents. Proximity to the terminal also meant that Rockville Centre did not require large fuel storage facilities of its own.

Three 20,000 gal. horizontal tanks, above ground outside the plant, sufficed, but now an additional 13,000-gal. tank is being installed. With transportation difficulties of the current war period, Rockville Centre may find itself using any fuel it can get, but the engineers have the important knowledge that their new engine is capable of burning this economical fuel with high efficiency. This will mean substantial dollar economy in the post-war period.

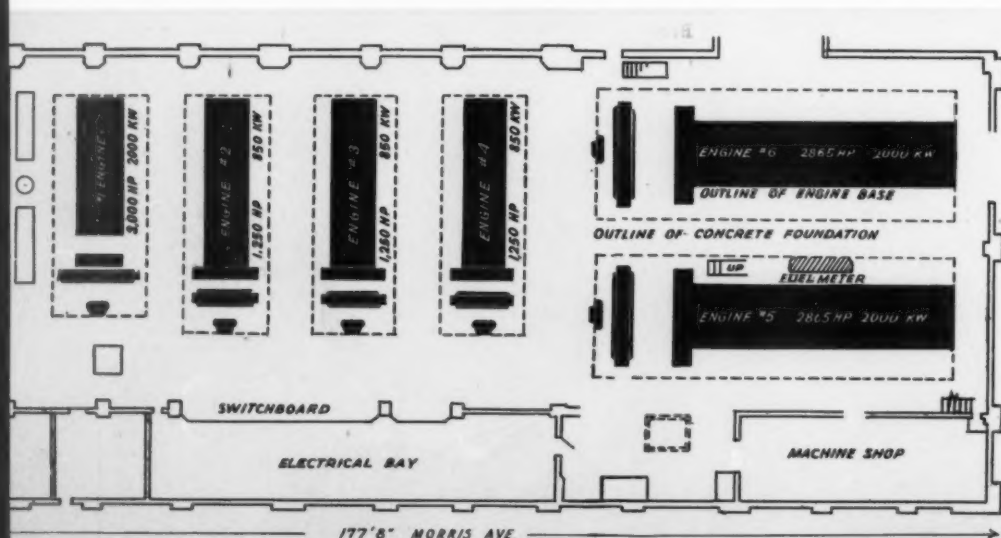
Fuel is brought to the plant in trucks and unloaded either by the trucks' own pumps or by a pair of motor-driven Blackmer transfer pumps. From storage, the oil is pumped through a master Neptune meter to four 500 gal. elevated day tanks inside the plant, piped in such a manner that fuel from any tank can be delivered to any engine. There is an individual Neptune meter between the day tanks and each engine so that fuel consumption of each unit can be checked closely. Major interest centers naturally in the new engine and the arrangement of this unit will hold the center of the stage in this discussion. Fuel for the new unit passes through a duplex Nugent pressure filter and is supplied under slight pressure by an engine-driven pump to the individual American Bosch injection pump for each cylinder. A Woodward relay-type governor rotates the grooved injection pump plunger in its barrel, thus regulating the quantity of fuel injected to meet load conditions.

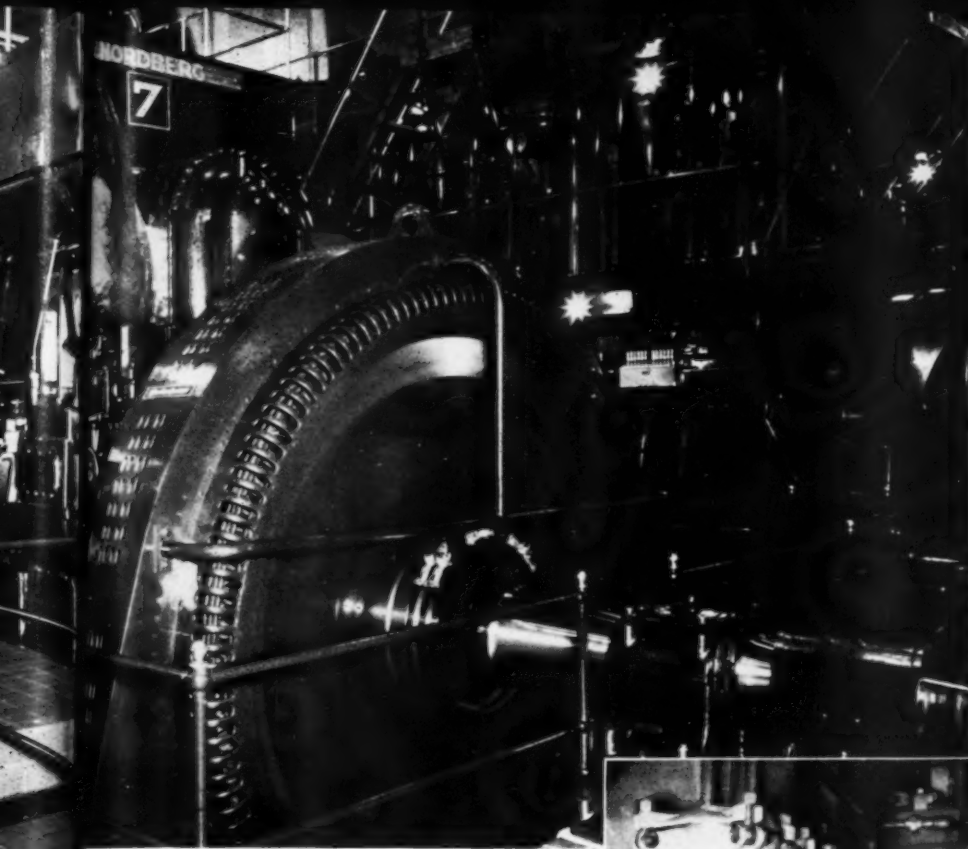
This Nordberg is a port-scavenging engine with a set of non-return air valves just ahead of the ports in each cylinder liner. At Rockville Centre, air is drawn through a Burgess intake snubber and a battery of American air filters in an ample brick section contiguous to the



power house. Air is delivered under slight pressure to the cylinder ports through the automatic scavenging valves by a 14,000 cu. ft. Roots Connorsville rotary blower gear-driven off the crankshaft. The brick air house also holds the Burgess exhaust snubber. A 36 in. ILG blower draws air from the engine room and blows it over the snubber. In summer, the heated air is discharged to the atmosphere and the blower serves to cool the snubber. In winter, the heated air is returned to the engine room. Two of the older engines discharge their exhaust gases through Davis waste heat boilers and, with the new engine, will provide all necessary heat for the plant. There is a Nordberg expansion joint in the exhaust line of the new Diesel.

Socony Vacuum DTE No. 3 is the lubricating oil used in the pressure circulating system of the new engine. Lube is drawn from the crankcase sump by a gear pump driven off the crankshaft and put through a Schutte & Koerting strainer and cooler. It then goes under pressure to the main bearings, then through drilled passages in the shaft, cranks, and crank pin to the crank pin bearings, through the hollow connecting rods to the crosshead pin bearings and crossheads. Most of the oil is forced into the pistons to cool the crowns. A motor-driven Blackmer auxiliary lube pump can be used in emergency to circulate the lubricant through this system and is used regularly to keep up lube pressure in starting and stopping the engine. Continuously, during operation of the engine, lube is drawn from the sump, cleaned



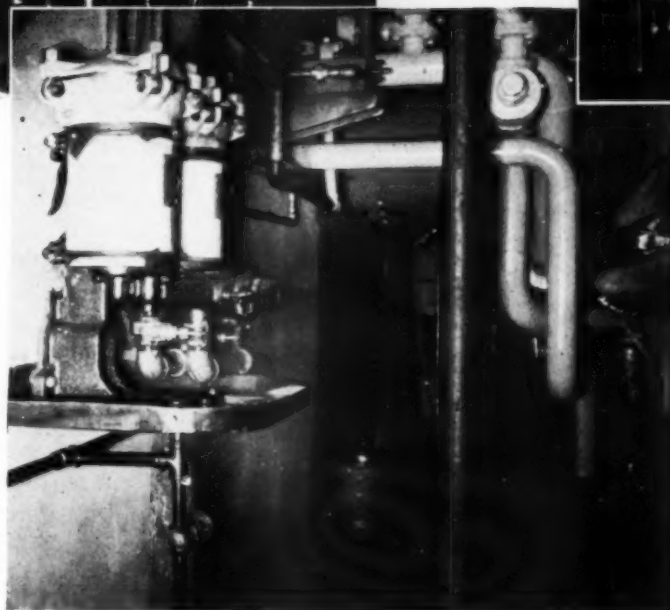


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in a Hilco activated clay purifier, and returned to the sump. Power cylinders are lubricated by a separate force-feed system with Manzel lubricators timed to feed the lubricant to the proper position of piston travel. DTE No. 5 is used to lubricate the cylinders.

The Nordberg was fitted into the flexible cooling water system which supplies the entire plant. This system, incidentally, is another example of the ingenuity and sound planning of Rockville Centre engineers. An old, abandoned standpipe on plant grounds was remodeled and fitted with Foster-Wheeler redwood filling and distributors. Sections were cut in the sides to permit atmospheric cooling and a Foster-Wheeler induced draft fan, driven by a two-speed motor, installed in the top. Thus, three degrees of cooling action are possible. In addition, the lower portion of the standpipe serves as a reservoir with more than 20,000 gals. of effective capacity providing an emergency water supply at adequate pressure in the event of pump failure. As a further precaution, there is a surge tank on the plant roof with a city water connection above water level in the tank. When this level drops, a Ross automatic control opens an admission valve and replenishes the tank supply with city water. Flexibility and efficiency in handling the cooling water is provided by four motor-driven Ingersoll-Rand centrifugal pumps, one rated at 1000 gpm., two at 600 gpm. and one at 300 gpm., all at 175 ft. head. No additions were necessary to accommodate the new engine, for the original installation allowed for anticipated plant



Above left: Most powerful unit in this plant, the new Nordberg 3000 hp. Diesel and 2000 kw. Westinghouse generator. Top: GE switchboard, below which is seen the Hilco lube reclaimer. Left: Nugent duplex fuel filter.

expansion. A close check on temperatures is kept with a Brown Potentiometer which records temperature of water leaving the engines, leaving the cool tower, at the base of the standpipe on its way to the engines, and wet bulb temperature of air leaving the tower. There are Motoco thermometers on the Nordberg. Brown pyrometers are used to check on exhaust temperature at each cylinder throughout the plant.

A gauge board on the new engine holds U. S. pressure gauges for fuel, lube, water, starting air and scavenging air. The built-in compressors of the air-injection engines provide plenty of air for starting, but the plant also has a motor-driven, three-stage, Ingersoll-Rand compressor which can provide starting air and also high pressure air for emergency use in the air-injection Diesels.

For safety, the plant has a complete alarm system. An Edwards annunciator sounds a Klaxon horn and indicates the seat of trouble in case of high water temperature, high or low lube temperature, or high or low lube pressure. The General Electric switchboard, set flush with one engine room wall, is particularly well equipped, with voltage regulators and totalizing and recording instruments.

Planned economy has paid real dividends at Rockville Centre. Costs of production have come down steadily until, in the fiscal year 1941-42, they were just 7.21 mills per kwh. The plant represents an investment of \$1,200,000 and all of this has been paid out of plant earnings. At the same time, substantial profits have been paid into the city treasury to sup- . . . And now please turn to page 78 . . .

R. F. D. EXTRAORDINARY

By DOUGLAS SHANKING

UNDER the title, "The Mail Carrier of Hell's Canyon," Richard L. Neuberger vividly described the Country's most awe inspiring mail route in the Saturday Evening Post for October 24. It is a moving tale of how stout hearted Kyle McGrady, a garage mechanic in 1938, answered the call to bring mail and supplies to 350 people who live along ninety-nine miles of turbulent river between Lewiston, Idaho, and Johnson's Bar, Idaho, with regular boat service: How McGrady began his venture with the *Don*, an aged craft purchased with the last penny of his savings and lost in Zigzag Rapids on the fifth or sixth trip. Whereupon this fighting Irishman announced that he was going to get another boat . . . "That river hasn't got me licked yet." And indeed the roaring Snake had met its master for, even though McGrady was broke—his indomitable will captured the fancy of friends who raised enough money, in addition to what McGrady could borrow on his house, to buy the 58 ft. all steel boat *Idaho* and fit her with a pair of 82 hp. three cylinder Gray Marine Diesels, based on the engine developed and built by General Motors, Detroit Diesel Division, adapted and equipped for marine use by Gray.

We are going to let Kyle McGrady tell what he does and how he does it in his own way—but, first, get a brief picture of this, the loneliest and most dangerous of the 103,442 mail routes in this Country. Ninety-nine miles, straight as you go, but who knows how many miles, really, up the Snake River, through fifty-odd boiling rapids, hemmed in by rock walls rising to heights that reduce Wall Street to a peacock alley and ending in a chasm 1000 feet deeper than any other in North America. That is Hell's Canyon—the testing ground for man and boat—yes, even a terrific strain on the imagination. Along this forbidding passage live the people who subsist on the land but depend on the *Idaho* and her master for the necessities of life—ranchers, miners, sheepherders, hermits and all—350 of them.

Here is Kyle McGrady's own story from manuscript, we venture to guess, written by his no less brave wife. "The boat leaves the Lewiston





These views portray the grandeur of the Snake River country and the hazards Kyle McGrady and his Diesel Craft "Idaho" must surmount to deliver the mail.



Diesel Craft "Idaho" Battles Hell's Canyon Rapids On Most Hazardous Mail Route In U.S.A.

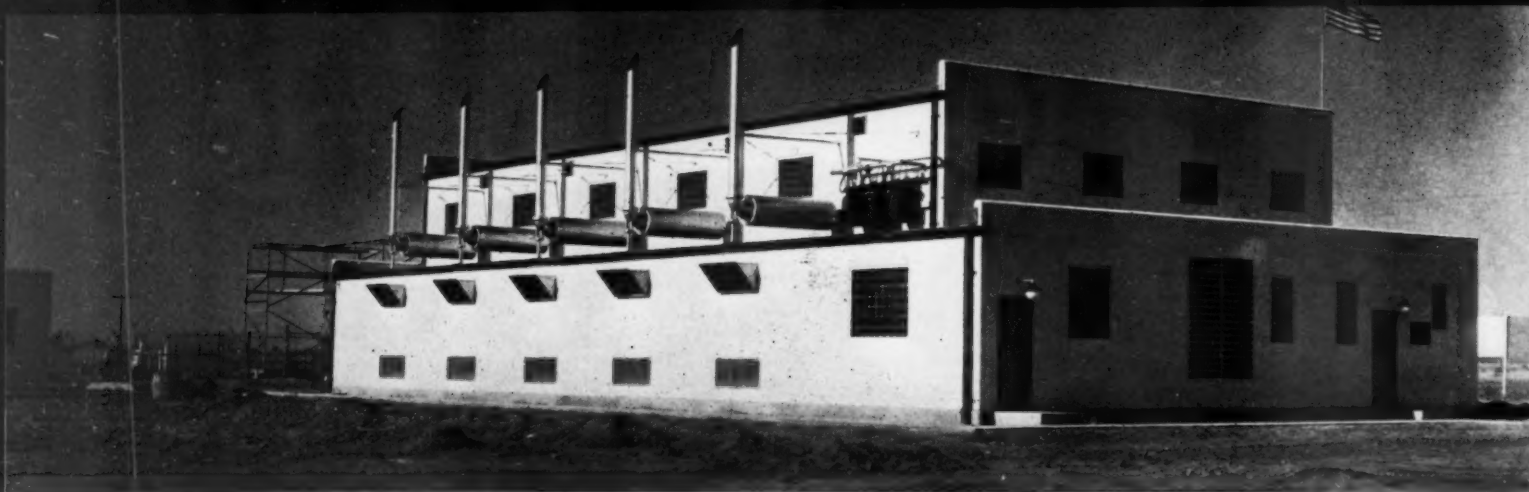
dock every Friday morning carrying mail, freight and passengers. It goes up the Snake River for one hundred miles, requiring an average of thirteen hours to go up. When the days are short, as they now are, we leave at break of day and continue along our way until darkness overtakes us, then tie up at whatever landing we find ourselves. We then get our evening meal, listen to our radio, and retire early. Next morning we complete our trip, getting up the river 100 miles. We return in about 6½ hours—just one-half of the time it takes to go up.

"For the first fifty miles we do not have very many rapids and we make about six stops in this stretch to deliver mail, groceries, and leave passengers. After the first fifty miles, we get in the real rough water. The rapids here are really 'tough.' Up at this end of the river there are about twenty different stops to make.

"The loads consist of groceries, salt, and grain. It is not uncommon to have aboard a ton of canned milk, potatoes or perhaps two or three tons of flour which would all be delivered to one stock raiser. That is the chief occupation—either raising cattle or sheep. Also, there are always quite a number of placer miners to be served. We haul their groceries, fuel oil and supplies of every description. Very often these miners pay me for their hauling with newly mined gold.

"Our busiest season is in the spring. In February we start hauling men to help with lambing, also enormous quantities of food and supplies. Many times we load the boat to capacity, a load of ten or twelve tons. This load would possibly all be delivered to one sheep man.

"These freight trips are usually made the first of the week or on special trips for, as I stated before, Friday and Saturday only are the days when I haul U. S. mail. On mail trips we sometimes have as many as forty passengers. Among the passengers are crews of sheep shearers, owners of ranches, miners, sightseers, and sheep herders. Many times on Sundays we have one-day excursion trips carrying as many as 55 . . . And now please turn to page 74 . . .



Exterior view of the Sulphur Springs, Arizona, gas engine plant. Note Maxim exhaust silencers.

By JIM MEDFORD

DESERT rural electrification demands special attention be given temperature control within main central station. There's nothing to do except bear it outside, when the temperature soars up around 140 degrees in the shade and that shade is the shadow on the blank side of a hot building wall.

There is, however, something you can do about the inside, and the Sulphur Springs Valley engineers, being old timers in the Arizona desert, went into this thoroughly when preparing plans for the strikingly modern structure that houses the five Cooper-Bessemer gas-converted Diesels in their generating plant at McNeal. Constructed of an approved type of cement block and plaster finished with white colorcrete for desert durability, the two-wing one-story building has windows of glass brick and doors of steel, creating a practically airtight headquarters for the personnel, excluding wasteland dust and heat. Another interesting feature is the locating of the auxiliaries, including cooling system, in the bays, leaving the main floor clear all around the main engines. The engines are five Type GN8 11½ by 13½, 8 cylinder Cooper-Bessemer gas engines rated 420 hp. at 450 rpm. They are of the marine type and can be installed with the flywheel on either end, whichever is convenient. This is accomplished by turning the engine block on the base. These engines may also at any time be converted to full Diesels by no more than by changing the power-cylinder liner, the pistons, and substitution of the injection system for the ignition system. No change in the cylinder head is necessary. This quick change feature is not only an advantage to every user, but the fact that the engine can be so easily converted gives a much higher resale value. The cooling system is compact, accessible, and attractively installed in the bay at the head end of the engines. An individual evaporative

type cooler is installed for each engine. A motor driven centrifugal pump of 15,000 gph. circulates the cooling water through the system of coolers and engine jackets. Both circulating and cooling water are chemically treated, using zeolite and salt as softening agents.

The alternators and exciters are direct connected to main engines by extensions of crankshafts through outboard bearings, with exciters on the shaft extensions. These alternators are rated at 356 kva., 80 per cent power factor and generate 4,160 volts at 60 cycles. Exciters are 7½ kw., 125 volts d.c.

Engine speed is controlled by a frequency controller so arranged as to be responsive only to frequency changes of the generating unit it controls. At the direction of the operator, it can be applied to any one unit or any number of units. This control regulator is a contact-making directional-current relay making contact in one direction when frequency is below 60 cycles, reversing when plus-60 cycles is reached. When contact is made, this closes a two-way magnetic switch which, in turn, closes the circuit to a Servel motor attached to the governor. When the engines are running slow, this motor runs in one direction decreasing the tension on the governor springs, causing the speed to increase. If the engines are running fast, the motor reverses in direction of rotation increasing governor spring tension, slowing speed.

To make up for the error made in changing the engine speed from below or above 60 cycles to 60 cycles, there is a time error compensator—a master clock run entirely by weights and fitted with an Invar metal pendulum, guaranteeing correct time for master control. Located in this clock is a photo electric lamp wired to receive light impulses once each second. The current generated by the photo electric cell is amplified and sent into the switchboard, correcting any time error of the electric clocks throughout the entire system.

In addition, provision is made for automatic synchronization of all engines on the line. When an engine is put into service, the operator, by means of a hand operated switch, brings the generator voltage to equalization with the units already in service. This hand operated switch regulates the speed of the small motor that is part of the frequency control previously described. When unit is brought up to even speed with other operating units, the automatic synchronizer is turned on and when the cycles of the generators are in step, the synchronizer closes the circuit, synchronizing the units. The operating current for this device is obtained from a bank of 24/5 volt wet batteries located behind the switchboard. These batteries also furnish current for switchboard indicator lights. These lights glow red for units in service, green for those idle. These batteries also furnish current for emergency lighting and alarm signals for engine failures.

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Worthington evaporative coolers are installed on main engine room floor to the rear of engines.

And, as in all plants of this type, voltage regulators are an important part of the precision equipment. These are of the electronic type employing radio tubes, mercury vapor tubes, rectifier rectifiers, as well as small transformers. Current for these is taken from the 4,160 volt bus bars, passes through a step-down transformer where it is cut to 380 on one tap and 110 volts on the other for use in the regulators. This current is converted into D.C. by the regulators and measured out to the alternator according to the demand. There is an individual regulator for each unit and, when two or more units are in service, the regulators operate in parallel. To quote Supt. M. M. Bennett: "They have proved very satisfactory, and are highly responsive to changes in load of the alternators." The prime movers were first purchased by the United States Engineer Department and in-

stalled for auxiliary power at Conchas Dam, New Mexico. On completion of the project, five of the six engines were purchased by the Co-operative and installed at McNeal. They were given a complete overhaul. As all the engines were not needed to start with, one engine was dismantled and the alternator used to float on the line, leaving it connected to engine crankshaft but removing the pistons. The object of this was to correct the high leading power factor caused by the 60-mile, 4,400-volt transmission line, an effective method. These four engines have operated a total of 30,000 hours since being installed at McNeal, without one hour of shutdown due to engine failure, three-fourths of this time being under full load. As an example, No. 4 engine was overhauled after 10,000 hours to its credit in this plant. After pulling the six pistons, heads,

General view showing five 420 hp. Cooper-Bessemer gas engine generating units.

and bearings, all that was necessary to do was to grind the valves and clean out the crankcase. The kilowatt capacity of the plant is 1,625 kw. per hour, and cost per net kw. was 4.97 mills during the peak for the month of June, 1942, with a total output for that month of 372,000 kwh. The total output for 1941 was 2,252,000 kwh., and for 1941, the first year of operation, 875,000 kwh. Output is expected to be considerably increased, as this less than three year old Co-operative plant is rapidly growing. Items of equipment include the five Cooper-Bessemer gas engines and General Electric alternators; switchboard also by GE and instruments by Westinghouse; air compressor by Gardner Denver; lube oil filters by De Luxe; lube oil reclaimer by Youngstown-Miller; lube oil cooler by Ross; lube oil pressure gauge and thermometer by U. S. Gauge; intake air filter is American cell-type; exhaust silenced by Maxim; pyrometers are Alnor; batteries by Exide; cooling water pumps by Allis Chalmers; cooling system thermostats by Detroit Lubricator Co.; miscellaneous gauges and thermometers also by U. S. Gauge; water valves by Walworth and Crane; lube oil alarm by Mercoid; flexible exhaust connections are U. S. flex-metallic; auto-synchronizers frequency controllers by Burlington Instrument Corp.; voltage regulators by Ward Leonard Co.; building air-conditioned by the Trane Co.; lube oil Vacme B by General Petroleum Co.

U.S. NAVY TUG "TUSCARORA"
powered with two 2-cycle GM Diesels
with direct-connected generator
exciter.



U.S. NAVY SUBMARINE
TENDER, powered with GM Diesels
for greater maneuverability and
longer cruising range.



HIS MAJESTY'S RESCUE TUG
"FAVOURITE," powered with GM
Diesels. Auxiliary equipment also GM
Diesel-powered.



THEY'RE RIGHT IN THE THICK OF IT

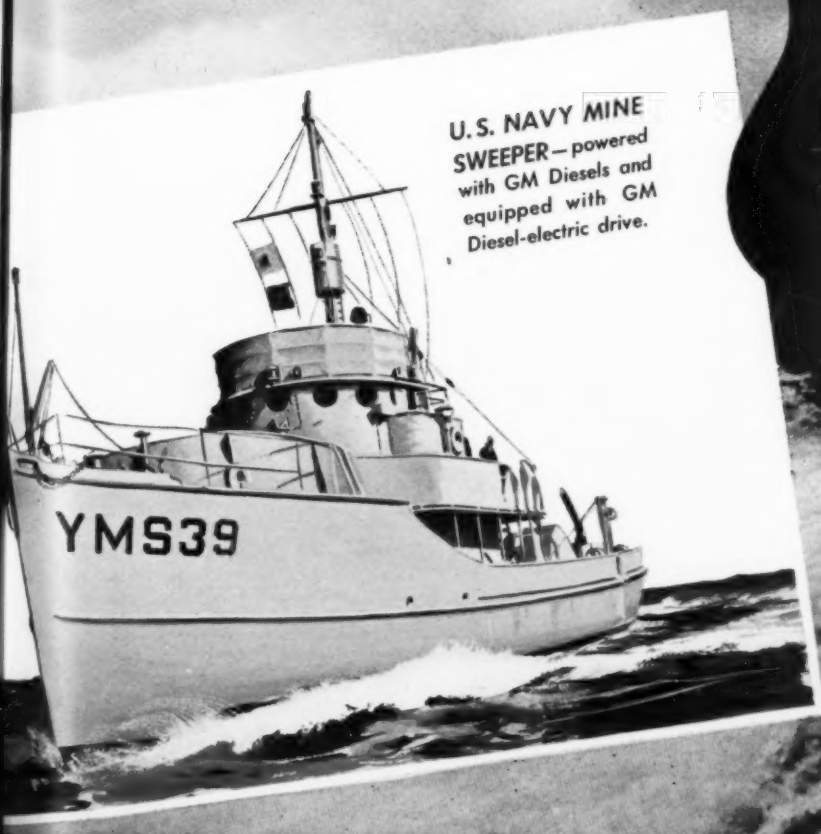
Undersea on the offensive—on the surface for rescue and salvage and supply, you'll find ships powered by GM Diesels.

Hundreds of Navy and Coast Guard boats depend upon GM Diesels. For they

have proved their high efficiency and dependability—have proved they provide extra measure of range and maneuverability.

They are doing the tough jobs of war just as they do the hard work in peacetime.

CLEVELAND DIESEL ENGINE DIVISION, General Motors Corporation



U.S. NAVY MINE
SWEEPER—powered
with GM Diesels and
equipped with GM
Diesel-electric drive.

GENERAL MOTORS
DIESEL

MORE ABOUT GREAT NORTHERN RAILROAD DIESELIZATION

By CHAS. F. A. MANN

ANOTHER spectacular Diesel operation, typically a Great Northern fiendish creation, is on the vital 170 mile line connecting Great Falls and Butte. Here the line ascends out of the valley of the Missouri River at Great Falls and crosses the Continental Divide twice. Connecting the copper producing area around Butte with the copper refinery operation at Great Falls, and passing through the State Capitol at Helena, this is one of the most vital railroad links in the West, particularly now with heavy movement of Copper Matte (Blister copper) to the electrolytic refinery at Great Falls. No railroad ever built can match this for curvature—379 of 'em—and the pioneer type of grades still exist—a maximum of 2.2% in many spots. Present day operating requirements are all geared to heavy freight, and no passenger service amounting to anything, in a wild, rugged mountain region where the roadbed is hemmed in by river canyons, steep rocky hills, and countless tunnels, bridges, culverts and curves. The economics of operation in this region simply do not permit rebuilding the line and elimination of curvature, bridges and grades, with longer tunnels and heavy fills, so the 1942 operating demands must be met not by rebuilding the line, but rebuilding the method of operation. Here again the Great Northern has carefully figured the angles and demonstrated what a realistic, engineering viewpoint could do toward solving a vital war problem without piling up a tremendous new investment in new roadbed, yet keep the line at top capacity uninterruptedly. The problem resolved itself to that of installing heavier motive power to replace a fleet of short-coupled, worn out Mallet steam engines, coal-fired, without replacing bridges, enlarging tunnels, reconstruction of watering and coal dock facilities, and relaying steel.

The answer was quickly Diesel. The 48 ft. wheel base of cabs, relatively short rigid wheel base of the 4-wheel power trucks, the uniformly even wheel load and ease of negotiating curves,

Two-unit General Motors Diesel freight locomotive approaching the summit of the Continental Divide, near Butte, Montana.

made it obvious that more powerful Diesel locomotives could run over the same light rail than could modern new Mallet steam locomotives, which had to be of special Dachshund (next to the ground) type to get through the old-fashioned 1885 model rock-cut, unlined tunnels, of which there are ten on the road. The high tractive effort at starting, and at low speeds, made the Diesel ideal for the heavy pulls on the sharp curves, some of which could

not even locomotives running tire soft coal

Freight they are fast, close with the Californi



not even handle a modern 4-8-4 or 2-6-6-2 steam locomotive. And, besides, train crews were getting tired of being gassed in the tunnels by soft coal smoke and wet steam.

Freight trains on this run are not long, but they are heavy. Northbound, out of Butte, a fast, close connection must be made at Butte with the Union Pacific which brings cars of California fruit and produce to the bleak, cold

Montana mountain area around Helena and Great Falls almost every day in the year. These cars, together with heavy carloads of Copper matte, bound for Great Falls, must go through quickly and reach Great Falls by dawn each day. So they bought a two-unit, 2,700 hp. General Motors Diesel freight locomotive! It saved buying two \$140,000 steam mallets and doing some \$500,000 worth of reconstruction of the line and facilities.

The line reaches a maximum of 6354 ft. elevation and the temperature ranges from 100 above to 50 below zero, the quickest change and the sharpest range in all of America. Icicles form in the ten tunnels and on the bridges within a few hours. In summer, the mountain grass is dry and a terrible fire hazard, especially when the wind starts blowing out of the blue sky and over the peaks of the nearby Rockies. The Diesel does not set fire to the



right of way like the hot cinders from the Mallets, nor does it gas up the unlined rock tunnels, nor corrode their roofs with acid smoke that blows out of steam engine funnels. The tunnels range from 1283 to 6145 ft. long, some of which have a 2.2% grade.

Let's ride Extra 5600, coming out of Butte with forty-two cars and 1341 ton load. This train is pulled by the two-unit Diesel which left Great Falls 170 miles North, early the morning before, with a local way freight. After a quick turnaround and close connections in Butte, it begins its overnight run to Great Falls. A nine mile grade of 2.2% from Butte, at 5,500 ft. elevation, brings it to Woodville Summit at 6354 ft. elevation. Then down to Basin to elevation 5,000 ft. on a 2.2% descending grade. Then up for seven miles Boulder to Amazon and down a 1% grade to Clancy on the Missouri River. The new Diesel hauls 1340 tons out of Butte in forty minutes up that nine mile hill, while the old Mallet could only handle 950 tons and took one hour and fifteen minutes. Engineer Andy Clifford swears the improved vision on sharp curves and the fact he doesn't have to stick his neck out all the way to Helena is the finest feature of the big new Diesel!! And he smiles broadly when you ask him about the smoke in the tunnels. "Look, I wear a white collar and a necktie on this run now. I used to be as black as your hat."

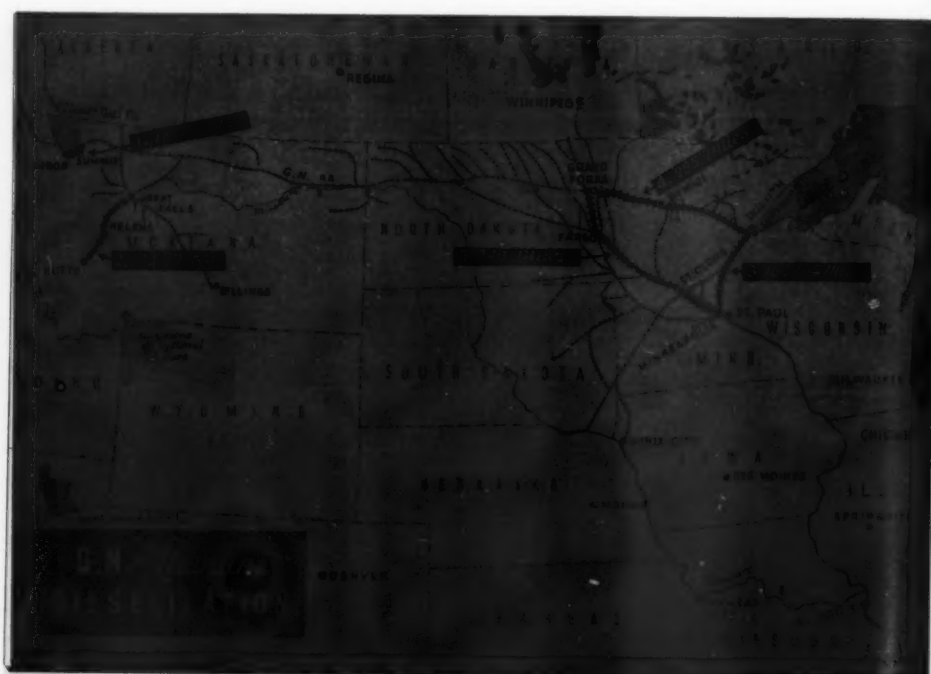
It takes from eighteen to thirty hours to make a round trip. The Diesel will haul 2400 tons out of Great Falls to Helena in the easy grade part of the run, and the thing does all the switching there, right to the produce docks in the heart of town, noiselessly and smokelessly, in the quiet dead of night, without waking sleeping Capital City residents directly above. They voted a round of Montana drinks to Great Northern officials for this—an item of note in a Capital City of a State that distrusts big corporations and railroads, instinctively.

The 90 lb. rail holds up nicely, and the old water tanks will be scrapped when another Diesel is put on the run and steam power abolished. Tonnage increased nearly 48%; Helper service eliminated on 54 mile district and reduced 50% in a 10 mile run; 7,000 train miles saved in two months of operation. Out of Helena with thirty cars and 1534 tons, the Diesel whizzed along at twenty miles per hour up a 1.2% grade and the throttle only in position Two. And fifty miles per hour approaching Great Falls at dawn, right on schedule. Three hours later the run back to Butte begins and, thus, the Diesel ties Great Falls—Helena—Butte with 27 round trips every 30 days.

There are two sets of Twin Cities on the Great Northern—St. Paul—Minneapolis and Duluth—Superior. Between them flows the heavy commerce of the industrial and financial capital of the Midwest and the world's iron ore capital. It is not necessary to describe the Great Northern's unique Diesel "Rat Race" and the two 2,700 horsepower passenger-freight Diesel locomotives they have installed to do a job no other kind of power could do. Sufficient to say that the locomotives are General Motors, each with a 1320 hp. 16 cylinder Diesel, and medium geared for a combination freight-passenger workout on level country with speed and pulling power developed to the optimum. They will do seventy miles per hour, ample for fast night passenger service, and will each yank fifty freight cars at fifty miles speed, if needed. The Great Northern again has given Diesel a tough job to fill. It is best described by simply listing the run these twin lightweights have to fill. Each does a forty-eight hour stretch between cycles, so by starting one out on a Tues-

day and the other out on a Wednesday, the reader can easily see how the scheme works. Both have heating boilers for handling passenger trains: Leaves St. Paul on No. 24 (Passenger), Arriving Duluth, 11:58 A.M., 160 miles; Leaves Duluth No. 19, Passenger, Arrive St. Paul 8 P.M., 160 miles; Goes over to Minneapolis, leaves on fast freight at 10 P.M. arriving Superior 4 A.M., 165 miles; Leaves Duluth on No. 23, 8 A.M., Arrives St. Paul 11:59 A.M., 160 miles; Leaves St. Paul on No. 20, Passenger, arrives Duluth 8 P.M., 165 miles; Leaves via Superior on fast freight at 10 P.M. and arrives Minneapolis about 4 A.M., 165 miles; Goes to St. Paul and again catches up to No. 24 for the 8 A.M. trip to Duluth; a schedule of nearly 1,000 miles each 48 hours on four passenger and two freight trains.

The other 2700 hp. Diesel operates on alternate departure days on the same schedule combination. Four hours is the longest layover each twenty-four hours.



Until the Great Northern hit on the idea of widening the cab of a conventional, standardized General Motors 1000 hp. 12 cylinder switching locomotive, the single unit, eight wheel, single engineer's cab GMC model of switcher was just that—a powerful, wide-visibility switcher for yard work—the truckhorse of the Diesel fleet.

Then the G.N., surveying its flat acreage lying almost West of the Great Lakes and Duluth-Superior and slightly Northwest of St. Paul-Minneapolis, decided that it was uneconomical to operate lightweight steam power on trains when Diesels were so cheap. So it refurbished three of the 1000 hp. General Motors Diesel switcher types, widened the cabs to full width, painted them cheerfully, and installed a heating boiler, and put three of them to work on the St. Paul-Minneapolis-Grand Forks, N.D.—Duluth-Superior triangle run. It worked!

The three lightweight Diesels run the following three-day schedule of overlaps, short connections, and fast passenger work, so that every three days one of them always gets back to Duluth to start the triangle over again as a Passenger-Switcher de luxe: Leaves on Passenger Train No. 35, from Duluth at 9:30 P.M. for Grand Forks, arriving Grand Forks 7 A.M., 295 miles; Leaves Grand Forks on No. 12 at 12:01 P.M. for St. Paul, arriving St. Paul at 8:28 P.M., 340 miles; In switching service from 8:30 P.M. till 7 A.M., 10½ hrs. switching;

Leaves St. Paul 8:30 A.M. on Passenger No. 11 and arrives Grand Forks at 6:05 P.M., 340 miles; Leaves Grand Forks on Passenger No. 36 at 10 P.M. arriving Duluth at 7 A.M., 295 miles; Switching Service at Superior all day, 11½ hours; 1270 miles of road work and twenty-two hours of switching service every 72 hours with but two hours' time out for servicing, and two sharply contrasting kinds of work.

Such is the Saga of the Overworked Great Northern Diesels!!



Besides Dieselizing its Continental Divide helper service, between Walton and Summit, Glacier Park, Montana, The Great Northern Railway has just installed a neat little Diesel generating plant, even below, to provide electric light and power for the station roundhouse, company hotel and water pumping at Walton, Montana. The plant consists of two identical P-40 4 cylinder, 4 cycle, Caterpillar Diesel generator sets, delivering 22.5 kw. at 440/220 volts for the entire source of power for this busy little Community. Entirely automatic, except for checking lube, oil and water, this plant needs no attention and runs in the coldest weather or on the heaviest summer tourist load, when fishermen from all over the U.S.A. come to Isaac Walton's famed fishing grounds and get lost in the streams from the West slope of the Montana Rockies.





BREAKING UP LOG JAMS WITH DIESEL TRACTORS

By BOB ARENTZ

PROVING itself to be a combination duck, submarine, and a "white-water man" of the deepest purple, a Caterpillar Diesel tractor is doing yeoman work in lumber drives in the great northwest. Manpower in the tall timber is plenty scarce nowadays and experienced river men just can't be had. To complicate this fact, rail transportation is also at a high premium, therefore making it more practical for operators to go back to the river ways.

What with rising wage scales and all, the trend in recent years has been toward rail transportation for milling timber. But, now, with a single Diesel "Cat" equipped with a LaPlante-Choate bulldozer doing the work of a full crew, the

swing of expense is definitely to the water. This drive down the Clearwater River to the Potlatch Forest Mill at Lewiston, Idaho, in which the "Cat" and a skeleton crew cleared the beached logs from shallow bars, effected a saving for the company of about \$4.00 a thousand feet over the cost of rail transportation.

The tractor worked with easy facility in water waist deep to a tall man and handled logs that would have tried the brawn of twenty of the ubiquitous old time river men as though it were pushing toys around on a living room floor. As nearly all the streams are now skirted with roads, the "Cat" was able to hit the highway for fast moving stretches, leaving the road

at almost any point to splash out into the shallow shoal water and break up log jams. Operational and upkeep costs in this type of work are a little, if any, higher than those met in ordinary road and construction work. Greasing becomes the important thing and with that taken proper care of the wear and tear from water hardly mates up with the grinding action of dust and sand on dry ground.

At times they are working in deep enough water to have the fan throw a fine spray and soak the operator, but engine failure is negligible and, so far, there has been no call for a salvage crew to dive into the icy waters and rescue a half drowned "Cat" from the river.



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Over 500 Navy trainees and their guests listening to Rear Admiral Richard S. Edwards' dedication speech at the new Navy Diesel School in Cleveland.

NAVY DAY IN CLEVELAND

By REX W. WADMAN



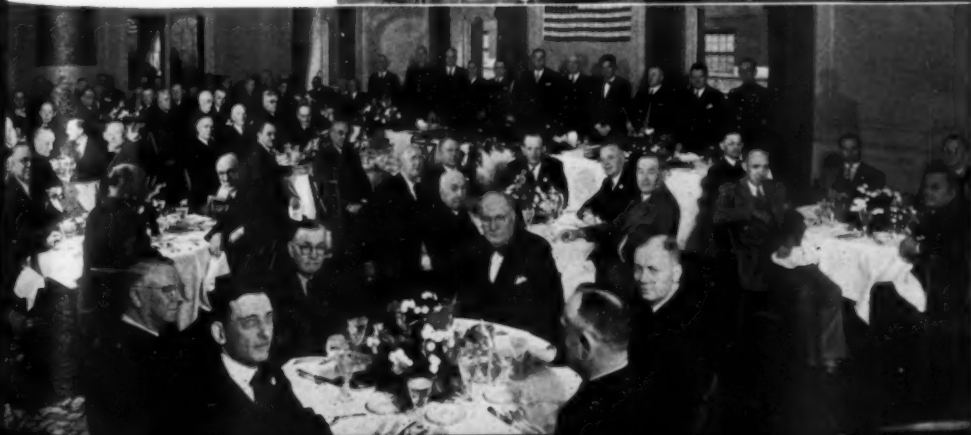
Top, Rear Admiral Richard S. Edwards, with George W. Codrington at his side, making his speech at the Navy Day luncheon, Union Club, Cleveland, Ohio, October 27.

George W. Codrington, Vice President of General Motors Corporation and State Chairman of the Ohio Navy League, introducing Rear Admiral Edwards in the Public Square of Cleveland on Navy Day morning.

The head table and many of the leading industrialists and marine men of Cleveland attending the Navy Day luncheon at the Union Club.



Cleveland, Ohio, October 27, 1942—Navy Day was celebrated here with more enthusiasm and more elaborately than ever before. Rear Admiral Richard S. Edwards came up from Washington and he was a busy man from the time he stepped off the train until the time he left at night to go back to his job of helping Admiral King in developing Navy strategy. Possibly the most important thing the Admiral did here today was to dedicate formally the new Navy Diesel School for advanced training of Naval Diesel engineers. This was done late in the afternoon out at the school which, while not entirely completed, is actively functioning. The school adjoins Plant No. 3 of the Cleveland Diesel Engine Division of General Motors Corporation and some 1,000 enlisted men of the U. S. Navy will be trained here in six-week-tours to learn to operate and service the Diesel engines which they will find in practically every ship to which they may be commissioned. Lieutenant F. H. Phipps, Jr., was put in command of this new school this afternoon and over 500 fine looking lads stood to attention as the Admiral walked out on the platform to make his dedication speech.



THE war has brought a marked change of emphasis on power in the milling industry. Previously the miller was interested in Diesels because they provided the cheapest means of turning his machinery to produce a barrel of flour. Today, while retaining interest in costs, he is preoccupied with the dependability of his power supply. He sees in the Diesel a source of energy which cannot be rationed or diverted. A year or two ago, in discussing the Minneapolis mill of the Commander Larabee Milling Co., we would have put major emphasis on the fact that its 2760 hp. Fairbanks-Morse Diesel plant produces power for 7.32 mills per kw. hour, less than 6 cents per barrel of flour, with a resultant saving that runs into six figures. We don't intend to neglect that aspect in this discussion, but interest gravitates naturally to the fact that this Diesel plant has supplied all the power requirements of this 3500 barrel mill for ten full years and generated more than 50,000,000 kw. hrs. without a power failure. That's the kind of service that gives meaning to a miller's wartime Thanksgiving Day.

Commander Larabee, lacking a crystal ball, was not preparing for the war when they installed their Diesel plant in 1932, but they could not have done a better job. Maximum demand at the time was about 900 kw. and it was decided to install three units of such size that any two could carry the peak load. The engines chosen were five cylinder, 16 in. x 20 in., two cycle, mechanical-injection, pump-scavenging, Fairbanks-Morse Diesels, each rated at 800 hp., at 277 rpm. Each drives directly a 689 kva., 551.4 kw., 3 phase, 60 cycle, 2400 volt, F-M alternator. The fourth engine in the plant is a 6 cylinder, 14 in. x 17 in., crank-case-scavenging, F-M Diesel rated at 360 hp. at 257 rpm. driving a 240 kw. F-M alternator.

The latter unit had been in operation since 1925, running in parallel with an old steam plant, and demonstrated to the company the potentialities of Diesels. Even in 1939, when the peak demand reached 1365 kw., it was possible to keep one engine in reserve. With normal peaks around 1100, two of the big engines can handle the load, leaving one 800 hp. unit and the 360 hp. unit as insurance against interruption of the power supply. Thus, despite expansion of the load, the plant has met every demand for ten years without serious depletion of reserve capacity.

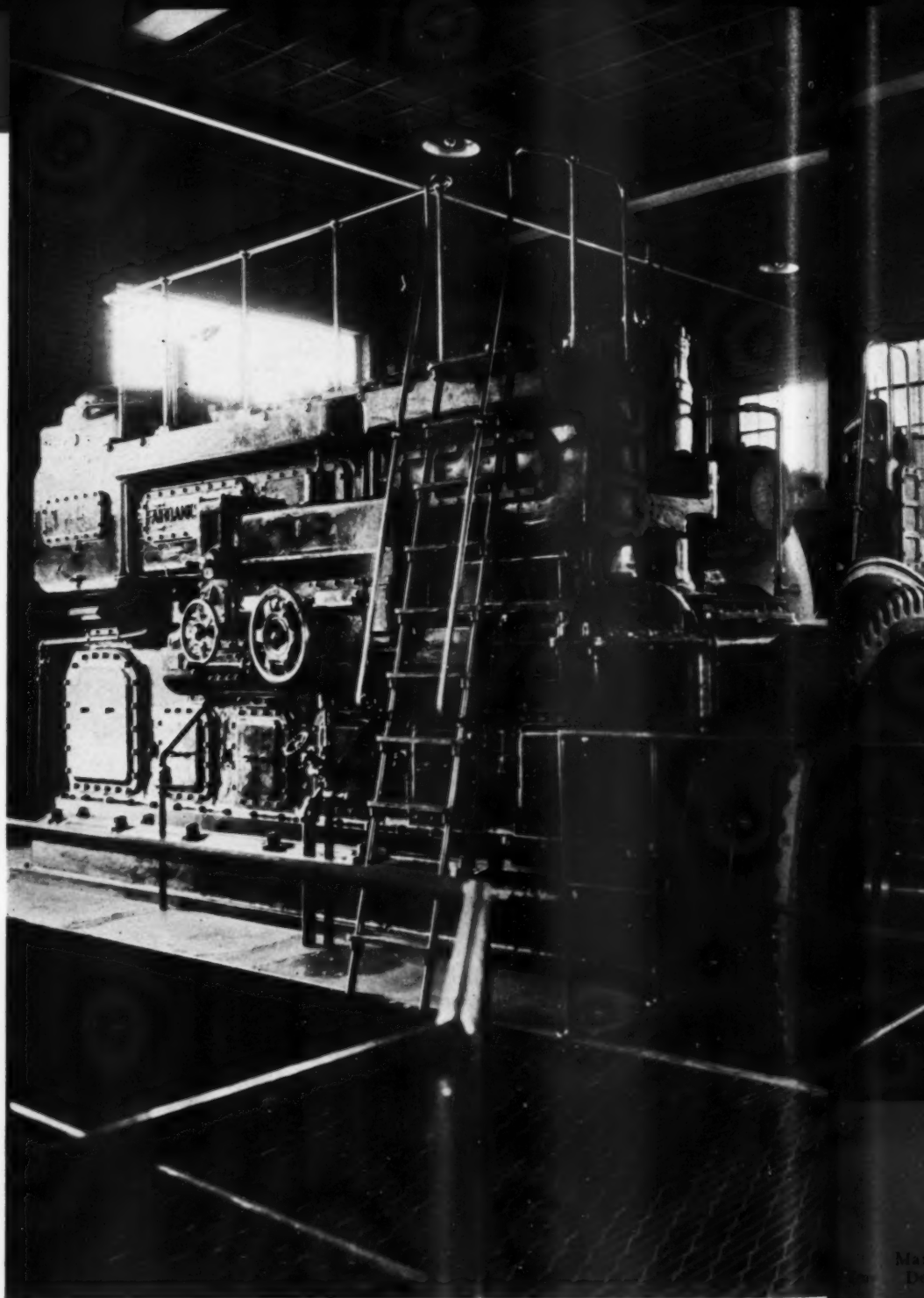
There is a Diesel in operation in this plant every hour of the year. One or more of the 800 hp. units is in service 85 per cent of the

time while the 360 hp. engine carries the off peak load for the remaining 15 per cent. The small Diesel is used commonly for lighting and to run the elevators when the mill is not in operation. The plant was put in service on the first of February and, therefore, the company figures its operating year from that date.

For the year ending January 31, 1942, there were two 800 hp. engines in operation 5161 hours, one 800 hp. unit for an additional 2283 hours and the 360 hp. engine for 1316 hours. Total engine hours for this average year were

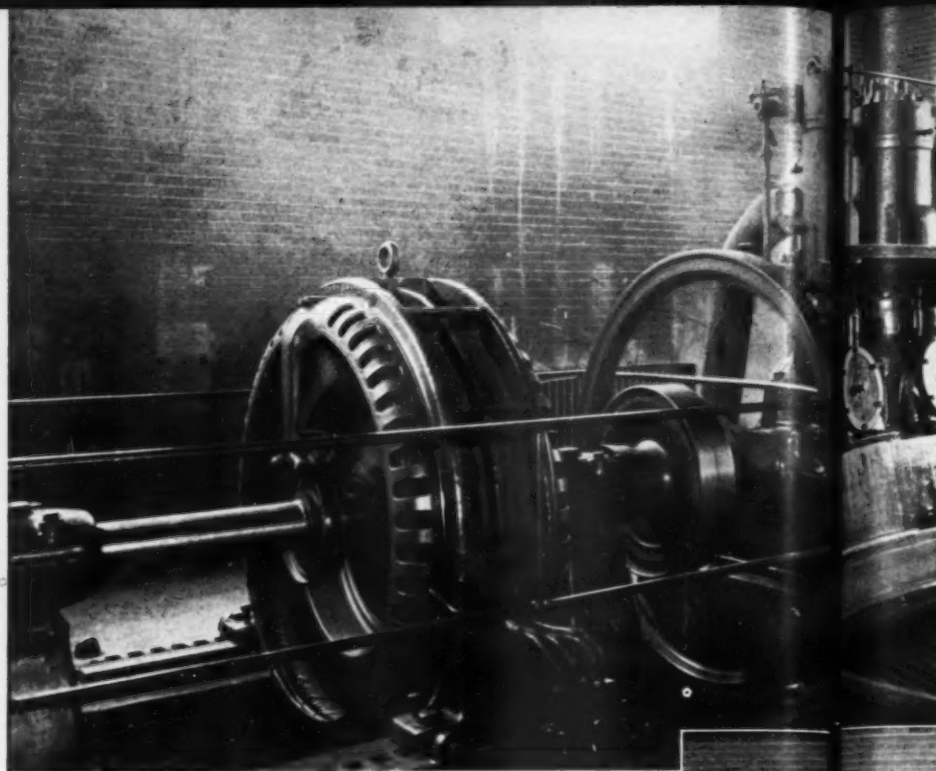
12,921. This means a ten year service record of nearly 130,000 engine hours. We repeat that, in all this time, there was not a single interruption of power.

When the company decided to abandon its steam plant, studies were made of the comparative costs of Diesels and purchased power. Every year since, the cost of power at the prevailing utility rates is calculated and compared with expenditures for Diesel operation. Nor do "Diesel costs" mean just fuel and lube. Every element of operating expense, including fuel,



lube, labor, taxes, insurance, maintenance and supplies, is considered. Table I gives the figures on power consumption and comparative costs for the full ten years since the installation of the Diesels. It will be seen that a flat sum of \$2400 a year is set aside as a maintenance reserve despite the fact that actual expenditures did not come near this figure. Logically this money can be charged against depreciation since it can be used eventually to replace all parts that wear, thus restoring the engines to original condition. Ignoring this factor, however, we find that Diesels have given Commander Larabee a net saving of \$216,068.45 in ten years, a sum adequate to pay the entire cost of the power plant and leave an impressive profit. The next ten years should give the company a clear profit of more than \$200,000.

Total consumption was 50,741,940 kw. hrs. Purchased power cost would have been 11.57 mills per kw. hr. while Diesel costs were 7.32 mills per kilowatt hour.



This 360 hp. F-M Diesel and generator is the veteran unit at Commander Larabee Milling Co., having been installed in 1925 and still in regular service.

This G.E. switchboard carries Marshalltown gauges. Foxboro thermometers.



Exterior view of the 3500 barrel mill with the power house in the foreground and vast mill buildings in the background.

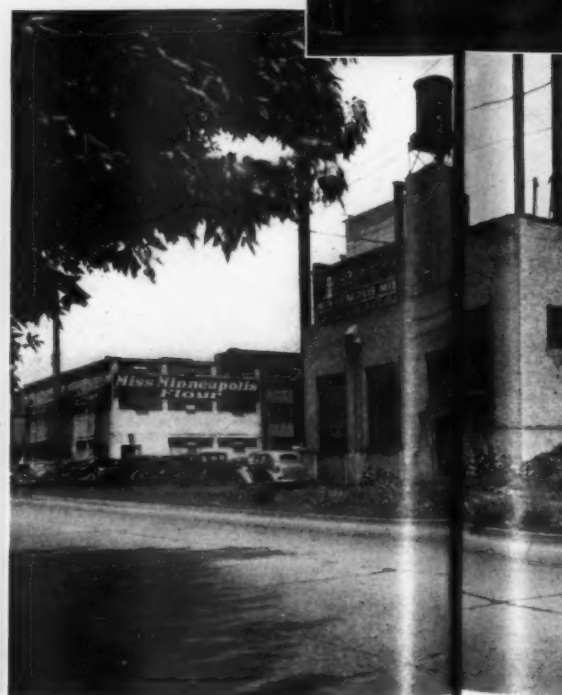


TABLE II

Month	Kw. Hrs. Generated	Fuel Consumed	Lube Consumed	Eng. Hrs. 800 hp.	Eng. Hrs. 360 hp.	Kw. Hrs. per Gal. Fuel	Bbl. Flour	Cost per Bbl. Flour
Feb. '41	461,520	39,796	239.8	966.25	66.25	11.60	58,470	5.55c
March	377,120	43,296	340.9	973	131.75	11.08	65,637	5.35
April	423,790	30,383	259	828.75	135.75	11.83	45,817	6.23
May	432,550	41,766	170.6	901	60.75	10.14	52,581	6.21
June	433,670	39,830	217.1	996.75	0	10.86	54,550	5.75
July	479,680	38,336	315.9	936.25	86.5	11.31	53,231	6.03
Aug.	455,930	40,455	382.5	988	45.4	11.27	60,415	5.75
Sept.	531,650	47,822	271.8	1,292.75	10	11.12	67,296	5.62
Oct.	458,850	31,859	262.4	764.75	100.25	11.49	49,338	5.47
Nov.	493,150	36,693	300.3	900.50	149.25	11.51	55,661	5.94
Dec.	478,020	43,929	377.3	982.75	203	10.88	64,217	5.97
Jan. '42	537,430	52,666	334	1,084.75	327.74	10.20	71,436	6.05
Total	5,563,360	486,831	3,471.6	11,605.5	1,316.64	11.41	698,649	5.90c



From savings of that order, the trail leads inevitably to a picture of engine efficiency. Table II gives figures on the last complete operating year showing monthly totals of kilowatt-hours, fuel and lube consumption and engine hours.

It will be seen that the plant produced 11.41 kw. hrs. for each gallon of fuel consumed. Another interesting feature of this Table is the record of flour production and the total Diesel cost per barrel of flour. With every element of expense discussed in Table I, the power cost of producing a barrel of flour in the year 1941-42 was 5.9 cents.

We have described briefly the engines and generators. Two motor-generator sets serve as exciters for the entire plant; each set consists of a 40 hp. F-M squirrel-cage motor direct-connected to a 25 kw., direct-current generator.

In addition, there is a 12½ kw. exciter which can be belted to an 800 hp. engine in emergency. Each of the big Diesels has a built-in engine-driven pump which circulates lubricating oil under pressure to all the bearings and forces a liberal quantity of lube up into the pistons to cool the piston crowns. Each engine circuit includes a Schutte & Koerting oil cooler and duplex strainer. If the circulating pump of any engine fails, pressure in the lube circuit can be maintained with a 200 gpm. motor-driven reciprocating pump which is piped to all three units. As an additional emergency protection, there is a Roper rotary pump belted to a 3 hp. kerosene engine. A force-feed lubricator on each engine supplies lubricant to the cylinder walls. Scraper ring oil drains to a 1000 gallon tank in the basement and is cleaned in 35 gallon batches in a Renuoil activated clay purifier. A small motor-driven transfer pump returns reclaimed oil from the clean oil tank to the engines. The 1000-gallon used oil tank was provided to permit draining all the lube from an engine for purification. Lube oil used is Standard of Indiana, Nonpareil.

The emphasis on avoidance of forced shut-down is evident, too, in the arrangement of the cooling water system. All the engines are served from a common header by a pair of 5 in., 800 gpm. vs. 60 ft. head, centrifugal pumps driven directly by 15 hp. motors, which circulate water through engine jackets and through the spray nozzles of a 50 ft. x 100 ft. spray pond. Either one of the pumps can carry all four engines at full load leaving the duplicate unit as a standby. For emergency there are two elevated supply tanks with a capacity of 5300 gallons. If the circulating

pump should fail with a resultant drop in pressure in the cooling system, water from the tanks automatically would flow through the engine jackets allowing the operator about eight minutes to correct the trouble or start the second pump. Makeup water is drawn from wells and put through a Zeolite softener.

Two panels of the eleven panel switchboard are devoted to such operating aids as exhaust pyrometers, pressure gauges, thermometers and alarms. The alarm sounds if pressure drops in scavenging air, cooling water, lube oil systems, or if water temperature rises. A red light tells the operator where the trouble lies. The G.E. switchboard also holds a vibrating contact voltage regulator, inverse time-limit overcurrent relays and totalizing and recording instruments.

Fuel can be unloaded easily by gravity from tank cars for the two 12,000 gallon storage tanks are buried under the railroad tracks just outside the plant. A 25 gpm. motor-driven pump transfers the fuel to the four individual day tanks inside the plant. The fuel for all the engines enters through an admission chamber equipped with float valve and motor-control. In filling the day tanks, the transfer pump is started by hand but switches off automatically when the tanks are full. There are five Niagara fuel meters, a master meter and one before each day tank. Before reaching the engines, fuel passes through a Zenith duplex filter to remove all foreign solids.

Scavenging air is drawn from outside the plant through sets of impingement-type filters housed in concrete. Exhaust gases go down to concrete expansion chambers and then up through vertical silencers outside the plant. All engines are started by compressed air supplied by two vertical compressors and stored in three tanks.

Both compressors are driven by 3 hp. motors and one can be driven in emergency by a kerosene engine.

Determined to keep the engines in condition for efficient operation at all times, Chief Engineer Harry Zoller pulls pistons for inspection every six working months. Maintenance is regarded as insurance of continuous production and preservation of equipment efficiency. Commander Larabee has achieved its two main objectives in the installation of the Diesel plant: provision of an unfailing power supply and reduction of power costs. The company has a ten-year record of production and profit to prove the soundness and success of their judgment in selecting Diesels.

AS many cities in the Southeastern States whose situation is comparatively near producing natural gas fields, Hattiesburg, Mississippi is finding that natural gas is a dependable and economical fuel when burned in an internal combustion engine of the heavy Diesel type. Hattiesburg is a growing city. Founded originally as a sawmill town in Mississippi's flourishing lumbering days a couple of generations ago, rail and highway junctions combined to make a natural jobbing center of the community, and its growth continued where other purely sawmill towns went into the discard. Today, Hattiesburg is crowded and the city's facilities are now on a twenty-four hour basis. Among the industries trying to meet the heavy demand is the ice industry, and among Hattiesburg's ice plants is the Home Ice and Coal Company, Inc. This firm, a family corporation headed by J. C. Phillips, is not mammoth in the field and is filling no war contracts. Nevertheless, local domestic and commercial use of ice is at an all-time peak and this firm has found it necessary to double its output. The company was formed about five and a half years ago. The original power source, according to Mr. Phillips, was an old and well-worn engine which was equipped to burn natural gas as a fuel. This machine had decidedly seen better days and a couple of month's operation of it was all Mr. Phillips needed to convince him that a new engine was in order. Accordingly, he installed a three cylinder gas engine of the Diesel type and due to an unexpected breakdown shortly after installation, Mr. Phillips became more thoroughly sold than ever on gas fuel in a heavy engine.

During this period of awaiting repair completion, electric power was used for operating the plant. The current cost for a month was \$650. After the new gas engine was again put into operation, the monthly fuel bill dropped to less than \$100.00. Five years of continuous production thereafter showed that this figure was no "fluke" but a consistent fuel cost, so that when plant expansion was decided upon early in 1942, it was no trouble to decide that the new engine should be of the heavy type and adapted to use natural gas for fuel.

Among the agencies contacted for supplying the new equipment was Arthur Duvic's Sons, marine and mechanical engineering firm of New Orleans and distributors for the Atlas Imperial Diesel in the Gulf area. The Duvic sales engineers presented such a complete plan for increasing the plant's capacity, according to Mr. Phillips, that no other solution except to give them the complete job seemed sensible.

The plan embraced the modernizing and improving of the equipment then in use, plus the addition of power and equipment to provide a dual system of two engines, two generators, two compressors, condensers, and freezing tanks.

The new engine recommended and installed was an Atlas Imperial, resembling the conventional Diesel, four cycle and of four cylinders 8 in. by 10½ in., developing 100 hp. at 514 rpm. and using natural gas.

Starting is by air. Alnor pyrometer equipment registers cylinder temperatures; an additional safety feature is the automatic-stop made by the Penn Electric Switch Company which protects the engine against lube oil failure or excess cooling-water temperatures. The Marsh oil-pressure gauge and Madison-Kipp lubricator are factory equipment, as well as the built-in governor and the Purolator lube oil filter.

Natural gas, straight from the mains, passes through the Vortex air-cleaner which automatically mixes the proper amount of cleaned air with the gas passing into the cylinders. Ignition is by spark plug with the American Bosch magneto. A well-designed feature of the installation is the placing of the lube tank about five feet above floor level, ensuring prompt flow of lube immediately upon starting. Cooling is closed circuit, for more effective temperature control. A Sims heat exchanger is used, the jacket water being circulated by a Lewis centrifugal pump. Another Lewis centrifugal pump, 6 in. by 6 in., supplies the raw water from the plant's own artesian well for serving the heat exchanger; this same pump also supplies cooling water to the two compressors and condensers.

The Atlas is direct connected, through Allis-Chalmers V-belt drives, to a 25 kw. 3-phase generator of 60 cycle and 240 v., and to a Frick 8 in. by 8 in. compressor of two cylinders turning at 360 rpm.

Current is supplied to the 7½ hp. motor driving the Lewis raw water pump and to five 3 hp. motors powering two agitators, two blowers, and an ice-crusher used for blowing crushed ice into trucks for dairy delivery, etc.

An additional freezing tank, 40 ft. 8 in. x 16 ft. 11 in. x 5 ft. 5 in., of a capacity of 338 cans was added. Using the Atlas and the Frick compressor and both the tanks, the plant has a capacity of 25 tons of ice daily. By throwing in the older engine, which the Duvics con-

nected to a 7½ in. by 7½ in. York compressor by a Fast flexible coupling, the capacity is stepped up to 35 tons a day.

The complete system works perfectly, says Mr. Phillips, and the plant is practically proof against breakdowns. With two separate and complete units of engines, generators, agitators, compressors, blowers, and tanks, arranged so that both units may be operated simultaneously, uninterrupted service is positive.

The Atlas alone is able to maintain satisfactory production; the blower and agitator supplied by the Duvics have ample capacity to handle both tanks, leaving one for a stand-by. Another handy feature supplied by the New Orleans firm is the 1000 lb. electric hoist equipped with double-can dogs for handling two cans; empty cans are racked and automatically filled.

By WARREN GLEASON



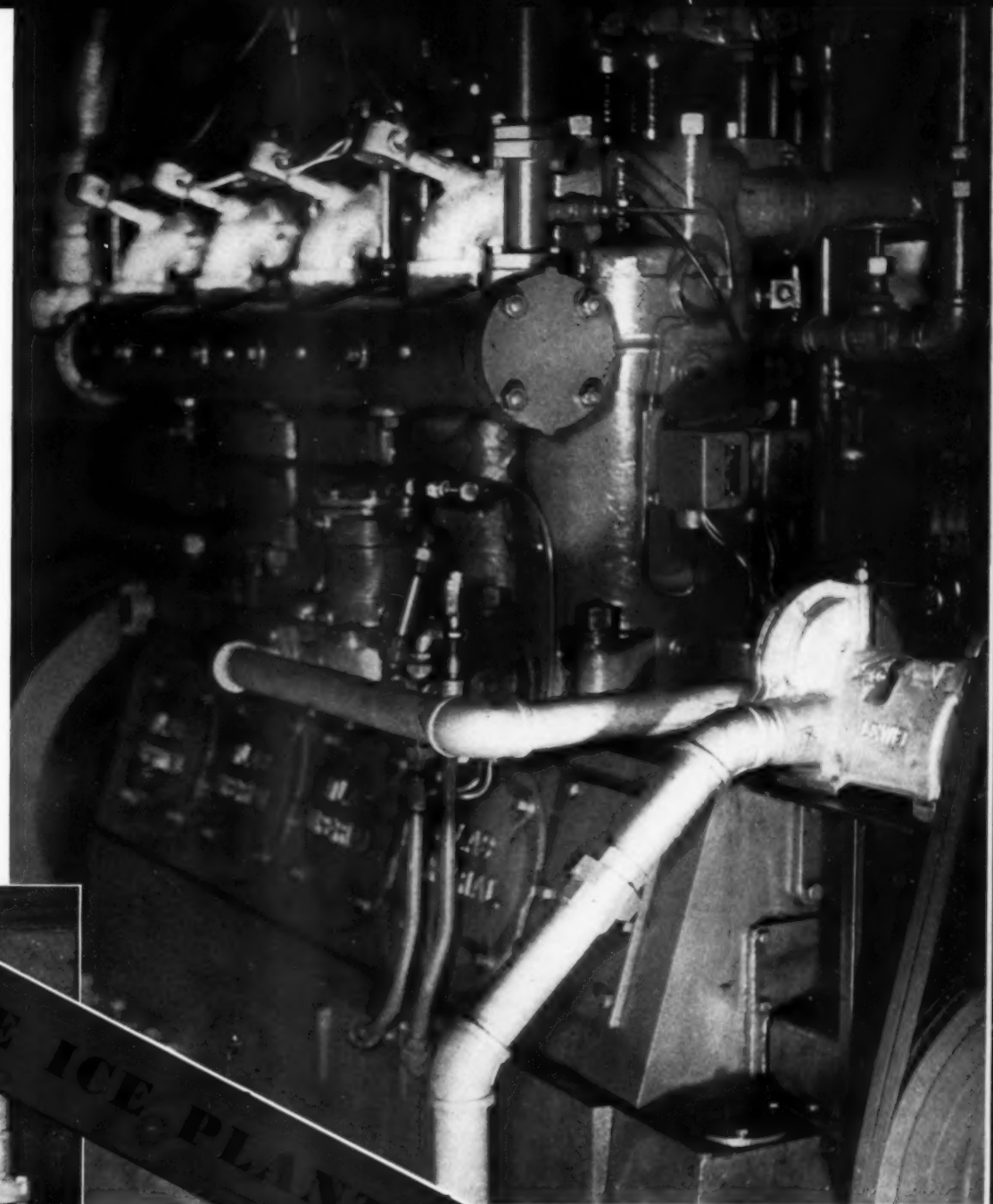
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As to operating cost of the gas-burning Atlas, the plant manager points out that the monthly fuel bill averages \$227.00, of which \$120.00 is charged against the Atlas. Since installation, the engine has been in operation twenty-four hours a day, with no troubles being reported in an unusually good season's production. Just change the lube oil every 300 hours, says the engineer, and the Atlas takes care of itself. Little current is now used from the local power company; about the only use of it is for a 2 hp. motor driving a Curtis compressor for maintaining starting air for both engines.

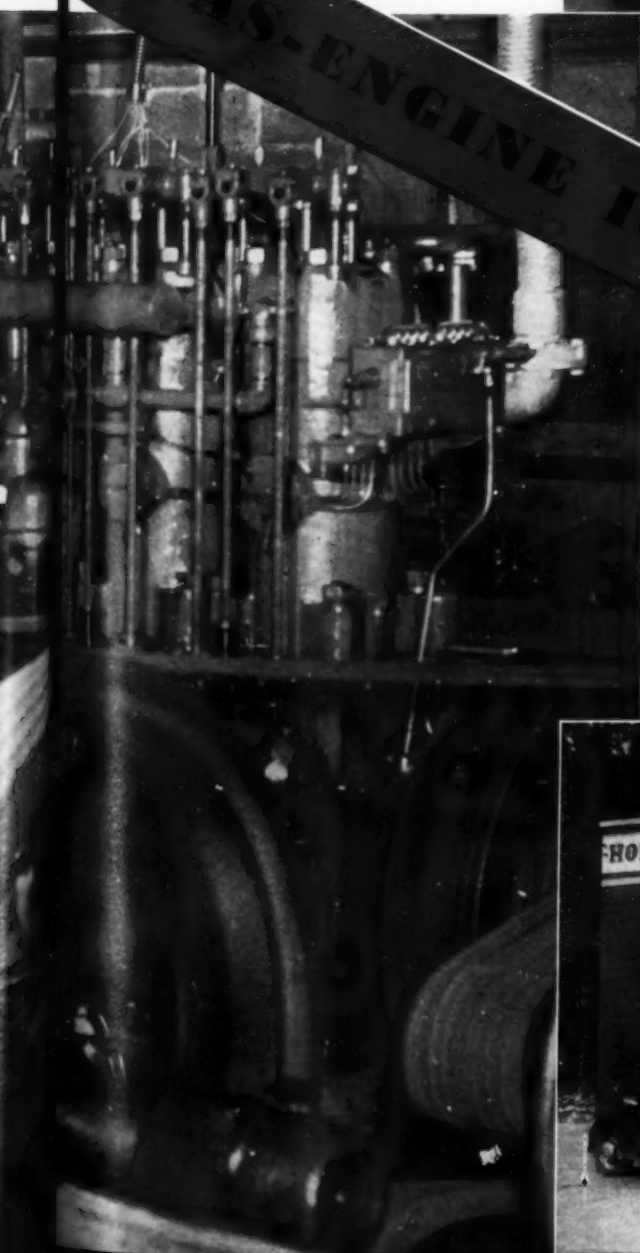
As ice plants go, the Home Ice and Coal is not a large one. Yet there are few plants to which more thought has been given towards all-around dependable twenty-four hour operation, and great credit is given by J. C. Phillips to Lewis Jensen, sales engineer of Arthur Duvic's Sons, and to the steady performance of the gas-burning Atlas Imperial.



Exhaust side of the Atlas gas engine showing Lewis circulating water pump, left center, and Penn Electric lube oil pressure and water temperature stop switches, right.



The business end of this Atlas Imperial gas engine crankshaft carries a pair of V-belt sheaves which drive the compressor and generator. The cylinder lubricator is a Madison-Kipp and the air cleaner a Vortex.



SINCE the day Secretary of the Navy, Frank Knox, issued a glowing tribute to the herculean role played by auxiliary craft during the historic and treacherous Pearl Harbor attack, the public has steadily become more aware of the vital role played by vessels of this type.

In the same ratio to their great need must their construction be also of the finest, to fit the important part they play in these crucial times. It is, therefore, only their prerogative that Ira S. Bushey & Sons of Brooklyn, N. Y.,

boat and are faired into the stem and stern frame. Accommodations are provided in the six rooms on the deck-house and the one room aft of the pilot house.

These naval tugs are each driven by a Fairbanks-Morse 7-cylinder, marine Diesel engine of 300 rpm., having a 20 kw. Electro-Dynamic shaft generator and turning a three-blade bronze propellor of special design. Fairbanks-Morse also furnished the Diesel auxiliary generator units, each comprising an F-M Model,

Diesel auxiliary air compressor units comprise a Fairbanks-Morse 2-cylinder, marine Diesel, a Gardner-Denver vertical air compressor, a Northern pump, Link Belt speed reducer and Fulton Sylphon fresh water regulator and lube oil alarm, all mounted on a common subbase.

Among the other well-known equipment now in service on these ships is the Youngstown Miller oil purifier, Schutte & Koerting water and oil coolers, and the Edison 100-cell battery. The electric hydraulic ram type steering gear

BUSHEY DELIVERS NAVY TUGS...



whose name is synonymous with the finest of tug construction, should supply America with these vessels in her time of need. A glance at the illustrations will show you these 100 foot vessels are of the heavy, rugged, serviceable construction. They also indicate the stability, power and strength to meet the most arduous service. They are of all welded steel, constructed on the Bushey "Chine" system, with four chines and four plates on each side between keel and deck. In this system, the shell plates are straight in transverse sections and are joined together longitudinally in a series of knuckles which fade out at the end of the

6-cylinder Diesel mounted on a common subbase, with a 20 kw. F-M generator, driven from the forward end of the engine, while the engine itself has a built-in clutch and flexible coupling on the aft end driving a Waterous 500 gpm. Rotary fire pump with integral herringbone gear reducer for 1,200 rpm. drive. These units, together with supporting auxiliary equipment are found in the spacious lower engine room that gives vivid testimony of the capacious operating quarters that mark Bushey installations and provide the maximum of working space for the engineers and engine room crew, a feature which makes for efficiency.

furnished by the American Engineering Company (who also supplied the electric driven capstan) and the hawsers are located in a compartment on a flat aft of the engine room. The Scaiffe company furnished the three 30 in. x 96 in. air tanks, while Maxim supplied the spark arrestor exhaust and intake silencers.

The supporting pumping equipment is practically all of Fairbanks-Morse manufacture and includes the 2 in. motor driven fuel transfer pump, a 3 in. pump and Roper oil pump for before and after service, both driven by an F-M 10 hp. direct current motor, a 1½ in.

motor driven auxiliary salt water pump unit and a $\frac{3}{8}$ in. rotary pump for engine room day tank fuel transfer service. Other F-M pumping equipment includes a $\frac{3}{8}$ in. motor driven galley range fuel transfer unit, as well as two 450 gpm. fresh and salt water system for automatic drinking water and sanitary use. L. C. Kovens and Bros., Inc., furnished these water system tanks. Directly above in the large and extensively equipped upper engine room we find the Brown pyrometer, a Weston tachometer, Ashcroft brass air pressure gauges, and Duragauge lube oil pressure gauge.

The Captain's quarters are both luxurious and serviceable, lined and trimmed in walnut and teakwood, with Johns-Manville rockwool in-

sulation. There's a large curtained berth, having built-in drawers, locker and shelf facilities, a good sized oak desk, built-in toilet cabinet, and rubber floor mats on battleship linoleum. The engineers' quarters for two has an upper and lower berth with built-in drawers, lockers, oak writing table and the officers' quarters are very similar. Even the regular crew quarters with two in a room have the usual array of Bushey facilities that far surpass those found on the average tug.

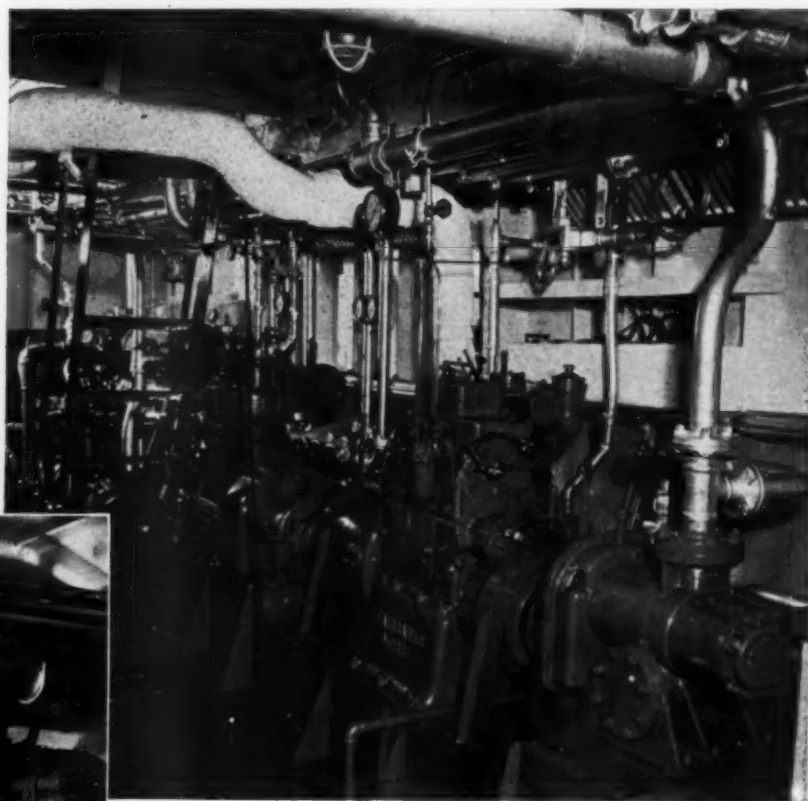
The pilot house is both roomy and fitted with an array of equipment designed to facilitate navigation. The 36 in. steering wheel is mounted on a brass stand, and readily available is the Negus flat compass with mahogany

binnacle stand, a Taylor mechanical type compensated barmeter, a Western tachometer, "Seth-Thomas" clock, speaking tubes and controls for the Sperry searchlight and gong system. The control switch for the steering gear has a Kirkland jeweled bulls-eye to indicate when it is in operation.

Auxiliary craft have long played a vital peacetime role and today's war conditions show instead of a respite, a still heavier duty to be performed. They may be called upon at nearly any time for nearly any service. They must be tough, powerful, and dependable. The Navy may feel assured that these tugs will be ready and able for any eventuality—they were built and equipped with that thought in mind.

← A typical Bushey Diesel tug joins the Navy.

→ In this view of the F-M Diesel auxiliary air compressor and pumping unit is seen the Fulton Sylphon jacket water regulator and lube oil alarm control, upper right.



← Main power for each of the Bushey Navy tugs is a Fairbanks Morse, 7 cylinder Diesel, as shown.

A six-cylinder F-M Diesel drives the raw water pump. ↓



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ARMY-NAVY "E" FLAG TO MARQUETTE METAL PRODUCTS



↑ A few of the distinguished guests: George W. Codrington; Commander Clayton S. Isgrig, USN; Frank D. Celebrezze; Captain Ross P. Schlabach, USN; Mayor Frank J. Lausche; Rear Admiral Bryson Bruce, USN.

Left: Rear Admiral Bryson Bruce presenting the Army-Navy flag to Mr. Herbert Gleitz, President of The Marquette Metal Products Company.

Cleveland, Ohio, October 26—Today in a still unfinished addition to its plant, The Marquette Metal Products Company of Cleveland became the proud possessor of an Army-Navy "E" flag. I have watched this plant grow year by year. My last visit to it was about ten months ago and, at that time, I thought it to be one of the most efficient machine shops I had ever seen, but when I went through it again today, I found that the plant had more

than trebled in size, with literally hundreds of special machine tools placed closer together than I have ever seen such equipment laid out. Yet there was no lost motion—just a steady production at a record speed of literally dozens of close-dimensioned machine parts destined for assembly into vital fighting units such as Diesel submarine engines, airplane propellers, Diesel marine engines, bomber windshield wipers, etc. To me this plant visualizes the tremendous

importance of the subcontractor to this War Effort of ours. Here is a plant devoting its entire facilities to making parts for other contractors, and doing a super-splendid job. To Herbert Gleitz, the President, and to his genial co-worker, Joseph Kustin, should go much of the credit for which the Army and Navy said "Well done!" today. These two men can be found out in the shop morning, noon, and night, doing a swell job for the war effort.

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AN immediate means of conserving vitally-needed natural and manufactured fuel gas for war production is to be noted in the operation of two engines on sewage gas at the southerly plant of the Cleveland sewage disposal department in Ohio.

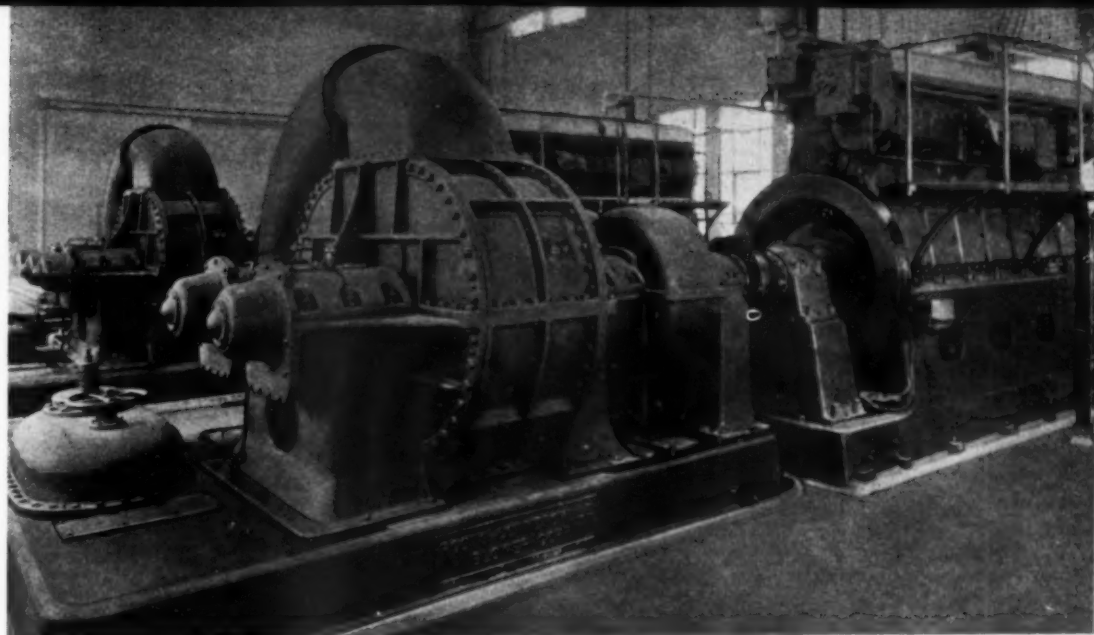
Not only is this operation saving \$10,000 annually but it is freeing, for production plant use, natural gas which, otherwise, would be required for fuel. The gas, readily available as a by-product in the country's sewage plants, represents a sizeable backlog of fuel, according to estimates. In the Cleveland plant, alone, there is sufficient gas to operate three additional engines and changes are being made to utilize it for incinerating sludge and other operations.

It is understood that every average-size sewage plant could heat its own buildings, incinerate sludge, heat the sludge in digestion tanks, as well as generate power for lighting and for machinery operation by harnessing the sewage gas which is now simply burned in most instances, and thereby wasted.

Collecting sewage gas and distributing it to industrial plants as fuel for operating production machinery or for power generation, to supplement supplies of natural and manufactured fuel gas, is an immediate possibility. This was stated by B. B. Williams, president of The Cooper-Bessemer Corporation which supplied the two engines.

"It is to be expected," said Mr. Williams, "that many other cities in the United States will follow Cleveland's example in availing themselves of this most economical means of power. Not only is the city of Cleveland saving itself a sizeable natural gas bill by utilizing sewage gas in its sewage disposal plant, but it is helping to aid the war effort by releasing natural fuel for other purposes. The ever-increasing mushroom growth of new war industries is placing a heavy burden on the gas producers, and this means of conserving natural fuel will be more than a saving and more than a service. It will actually become a vital necessity." The engines which make the Cleveland operation possible, and which serve the important function of driving blowers to discharge aeration tanks, are standard units.

No special accessories are required to operate the engines on sewage gas. They are standard 8-cylinder units with a bore of 11½ in., stroke of 13½ in., developing 420 hp. at 420 rpm. The engines are designed for operation either as straight Diesels, or to utilize natural gas as fuel,



Two Cooper-Bessemer engines of 420 hp. each driving Roots-Connersville blowers in the Cleveland sewage plant at Cuyahoga Heights, Ohio. These engines operate on sewage gas.

SEWAGE GAS ENGINES

CONSERVE

VITAL FUELS

By GEORGE D. CROSSLEY

whichever is most economical in the particular locality. They can be readily adapted for either type of operation. It is only necessary to make simple changes in the power-cylinder liner and pistons and substitute the injection system for the ignition system, or vice versa, depending upon the type of fuel. No change in the cylinder head is necessary.

This conversion feature is a decided advantage. Should the engine be installed for operation on gas and the cost of gas increase beyond a certain point, or the supply suddenly be exhausted, it can quickly be converted to a full Diesel.

Or should it first be installed as a Diesel, and some other fuel later prove more economical, the engine can just as easily be converted for operation on the other fuel. Nor is any special processing of the sewage gas required to make it suitable as fuel, according to G. E. Flower, sup't. of the southerly Cleveland plant.

"I believe," said Mr. Flower, "that the efficiency of these engines would be the same whether sewage gas or natural gas was used. The hydro-

gen sulphide content of the sewage gas is practically zero, methane 65%, carbon dioxide 30%, and nitrogen 5%. As an engine fuel, sewage gas compares favorably with other gases. The heating value of sewage gas will run from 600 to 700 btu. per cubic foot.

At present, internal combustion engine driven power plants fall into two divisions. The first may be classified as one in which gas engines are directly connected to the plant's generators.

Here, the sewage plant would be able to generate enough gas to operate engine-generating units continuously, and the electricity thus generated, in turn, could be used to operate motors to drive blowers, sludge pumps and a multitude of other motors used about the plant.

The other division may be classified as one in which gas engines are directly connected to blowers or other sewage equipment. This second method is generally used when the gas supply is not sufficient to provide enough fuel to carry the entire plant load. Blowlers are one of the largest consumers of power in the plant.

Exchange Your Diesel Maintenance Ideas

Conducted by R. L. GREGORY

Editor's Note: In this department we provide a meeting place where Diesel and Gas engine operators may exchange mutually helpful maintenance experiences to keep our engines in top condition. Mr. Gregory edits your material and adds constructive suggestions from his own wide experience. This is your department—mail your contributions direct to DIESEL PROGRESS.

Engine Performance And Fuel Economy Improved

By CLYDE P. THOMAS*

PERHAPS the greatest single improvement in the Municipal Water and Light plant of Leland, Mississippi, in the last five years is that of installing water recirculating pumps on the two Diesel units, the 625 hp. DeLaVergne and 600 hp. Fairbanks-Morse engine. There were



The recirculating pump on the De La Vergne engine.

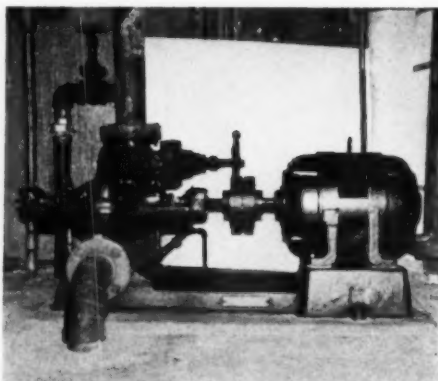
two main reasons for this improvement. The first was due to the fact that the Diesel plant was taxed to its capacity for power and the second was the fact that there was a heavy drain on the water systems. As there was no possibility of securing another Diesel engine until after the war, the operating personnel under the supervision of Mr. C. Q. Hollowell, General Superintendent, seriously considered the problem of improving the existing facilities of the plant.

Prior to the installation of the water circulating pumps, water was taken directly from the mains at about 70 degrees temperature for cooling of the engines. The waste went into

*Chief Engineer, Municipal Light and Water Plant, Leland, Mississippi.

the sewer at about 100 degrees Fahrenheit. This necessitated a large volume of water going through the engines, thus increasing the pumping costs and at the same time taxing the pumping equipment to its utmost capacity. This great variation of water temperature entering and leaving the engines has led to grief in some respects; namely, unequal expansion of the cylinder walls causing "blowby" and lower operating economy, waste of fuel and lubricating oil, foul and stuck piston rings; all these conditions leading to false or higher operating temperatures of the engines.

In December, 1941, two new Fairbanks-Morse recirculating pump units $7\frac{1}{2}$ hp., 300 gpm., connected by flexible couplings were purchased.



The recirculating pump on the Fairbanks-Morse engine.

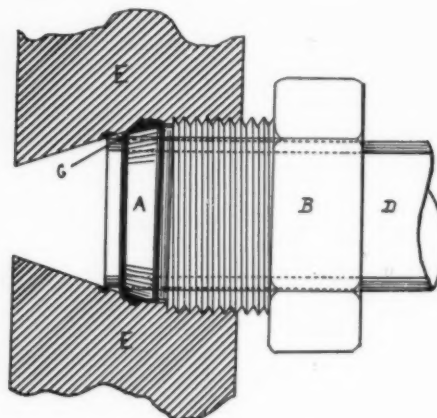
In March, 1942, the units were installed and put into operation. After five months of operation, it was found that the amount of water used was cut in half. Under the old system of taking water direct from the mains and going to waste averaged about 100 gal. per minute or 6,000 gal. per hour, while, under the new system of recirculating the water, 3,000 gal. were used, a saving of 3,000 gal. per hour. Instead of having a wide variation of water temperatures as under the old system, the recirculating water temperature system is held to a close margin. That is due to the fact that 300 gal. per minute were circulated through the engines with only five degrees shown in the incoming and outgoing water of the engines. Cold water is valued into the recirculating system to keep the circulating water held to an average of 140 degrees operating temperature.

It was also noted on these engines that smoother and quieter operation was obtained. Smoky exhaust immediately cleared up. Fuel economy was shown by the increased kw. per gal. The average kw. per gal. of fuel was 10 kw., but under the recirculating system 11 kw. per gal. of fuel was obtained.

The saving in fuel and pumping costs of water well paid the cost of the pumping equipment within a year's time. The operating officials say that this relatively simple problem has been solved and every expectation of the equipment has been realized.

Leakage in Heat Exchangers and Coolers

ONE of the vital points of operation in an air injection Diesel is that of keeping the air as free from moisture as possible. A certain amount of moisture will collect at all times in the compression of air, and this, of course, is kept at a minimum by bleeding or blowing down of the blast bottle and the various stages of the heat exchanger or air cooler.



Some engineers, however, have experienced trouble with leakage in the cooler itself as explained in the accompanying sketch. The area designated as "E" being a section of the cooler casting to which the air pipe "D" is attached. This is held in place by means of a cinch ring "A" which is tightly fitted over the air pipe "D," and this cinch ring is compressed by means of a cinch nut "B," thus holding the pipe "D" firmly against the throat in the casting "E," and making an air tight joint.

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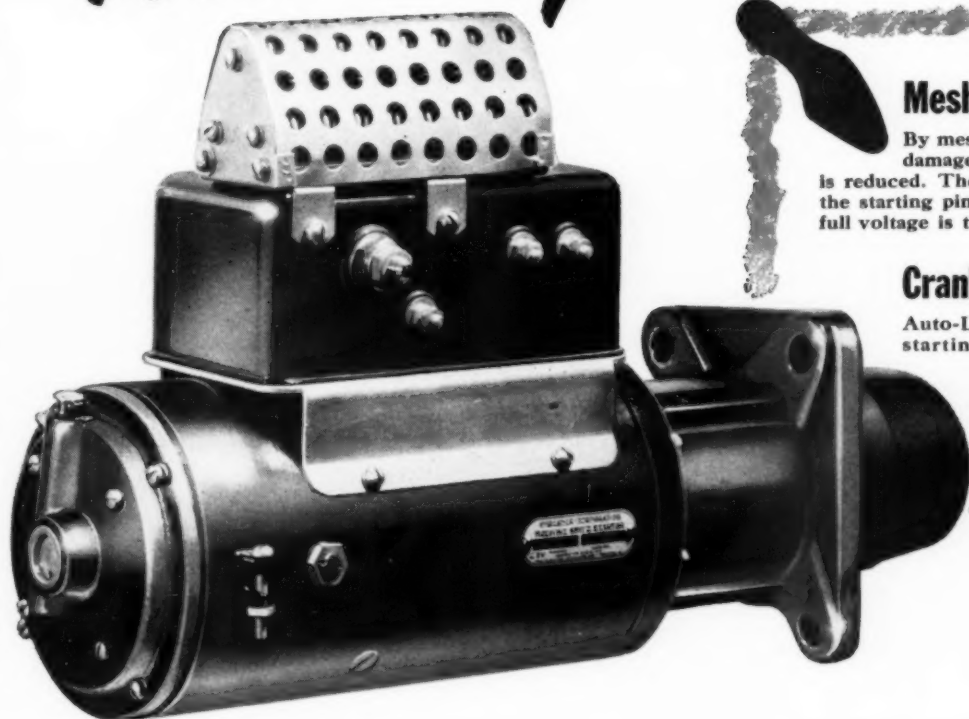
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IN ITS 26

AUTO-LITE

Two-Step Starter



Meshes on Low Voltage

By meshing on low voltage, possibility of damage to housing, pinion and ring gear is reduced. The starter simply takes it easy until the starting pinion teeth are fully engaged—then full voltage is turned on automatically.

Cranks on Full Voltage

Auto-Lite provides the excess margin of starting power, so essential in Diesel operation with this revolutionary new starter which cranks on full voltage.

Protects Housing, Ring Gear and Pinion Against Damage

Auto-Lite's two-step starter for Diesels uses low voltage to mesh the pinion. The starter simply takes it easy until starting pinion teeth are fully engaged and everything is set to overcome the high torsional load which is a function of Diesel starting. Then full voltage is turned on automatically and there is power and to spare for a fast, efficient start. The result is quieter, surer operation and a system that is easy to maintain. That's important now when positive starting is so often an essential under war conditions.

Auto-Lite also provides shunt generators for 6, 12 and 24 volt systems: 25 to 5000 watts capacities. Auto-Lite

Heavy-Duty Regulators have 3 units—voltage, current and cut-out relay—in one water and dust-proof assembly. Maintain voltage to plus or minus 2%. These regulators are integrally radio interference suppressed.

Auto-Lite starting and generating systems for Diesels are designed and built by the world's largest independent manufacturer of automotive electrical equipment. For prices and complete details, write to

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IN ITS 26 GREAT MANUFACTURING DIVISIONS, AUTO-LITE IS PRODUCING FOR AMERICA'S ARMED FORCES ON LAND, SEA AND IN THE AIR

AN OUNCE OF PREVENTION.....

Editor's Note:—Herewith is reprinted the second and final Section of the October issue of Sinclair Firebox. The first section appeared in the November issue of DIESEL PROGRESS. This excellent work on Diesel Plant Maintenance should prove helpful to operating personnel.

THE flow of lubricating oil has a manifold purpose in a compression-ignition engine:

First—it is intended to reduce friction by substituting “metal-to-lubricant” contact to “metal-to-metal” contact, and thus decrease wear.

Secondly—it is aimed at removing heat from parts which have a tendency to heat excessively due to their proximity to the combustion process or to great pressures and frictions.

Thirdly—it has a “detergent” action, which means that it is intended to “cleanse” the surfaces over which it flows from deposits of carbon, varnish or lacquers, thus keeping their finish to its original dimensions and smoothness.

The lubrication of a Diesel engine is recognized to be more delicate than that of a gasoline engine for several reasons:

- 1—The temperatures involved are higher;
- 2—The pressures involved are higher;
- 3—The fuel used is less volatile and has more tendency to dilute the lubricating oil;
- 4—There is greater tendency to form engine deposits due to the first three causes and consequently oils had to be made to withstand these harsher conditions.

Consequently the properties essential in a Diesel Lubricating Oil are:

- 1—Detergency;
- 2—High film strength and high degree of Oiliness to assure resistance to high temperatures and high pressures;
- 3—Low Carbon-forming tendency;
- 4—General STABILITY against oxidation insuring protection against CORROSION, GUM and SLUDGE formation, and against wear of cylinder liners, piston rings, pistons and bearings, even at overloads.

It has been recognized that while the nature of the Crude from which the Lubricating Oil originates is a definite factor in the success of

that oil, it alone cannot be taken as a criterion for the selection of a satisfactory Diesel Lubricating Oil; it would be very unwise to decide on this or that particular Lubricating Oil because of its paraffinic, asphaltic, or aphthenic base.

Obviously proper lubrication and protection of the mechanical parts of the engine, so essential during these days when breakdowns are particularly costly, presupposes that the lubricating oil flows uninterruptedly through all the passages designed for that purpose.

The interruption of the flow at any point, due to a rupture or a leak, a deposit of carbon or a clogging by some sludge will inevitably lead to a failure, either immediately or after a longer period of incorrect operation. That failure may or may not be detected by local overheating, loss of power or a particular noise: that is why it is so essential to make sure that the quality of the oil is of the best and that it is checked frequently and changed at regular intervals; and that inspection of the engine be made as a part of the regular routine of preventive maintenance, to make sure that all lubricating oil passages are free and clean.

Such an inspection will avoid the following difficulties:

- 1—Sticky piston rings;
- 2—Worn sleeves;
- 3—Broken pistons;
- 4—Worn, scored, seized or broken bearings;
- 5—Sticky and leaky valves.

It is recommended:

- 1—Use the best Diesel lubricant available.
- 2—Drain, clean or replace the lubricating oil filters at frequent regular intervals, as per manufacturer's recommendations.
- 3—Be sure that the oil filter is not of a type that will remove the “detergent” from the oil.
- 4—Drain and replenish the lubricating oil at frequent intervals as per manufacturer's recommendations.
- 5—Place the engine on a “periodic inspection schedule” to make sure that the flow of lubricant reaches all the vital parts of the engine.

Correct temperature is essential for proper operation; and, while that temperature must

be high where combustion occurs, it must be reduced as rapidly as possible to protect the metals that enter into the construction of the engine and avoid burning, pitting, scoring, warping. The part played by the lubricating oil in that cooling action has been described in the preceding chapter. But the cylinder blocks, including the heads, must necessarily receive a more active and intensive cooling. This is accomplished by a flow of water in all but the “air-cooled engines.”

Obviously, the flow of water must be unimpeded to operate according to the manufacturer's design and carry away the intense heat that would affect the valves, the injectors, the gaskets, sleeves, etc. Water must, therefore, be clean and free from corrosive elements or scale forming salt. If necessary, it should be chemically treated to eliminate corrosion, scale and sediment. If possible, the cooling water should be from a closed system, with very little makeup. Radiators or water coolers should be periodically inspected and kept free from sludge, scale and obstructions.

Water passages in the cylinder blocks should likewise be kept tight, to avoid leaks of water into the cylinders, air, or oil passages.

The water-jacket temperature should be checked frequently and kept within the range prescribed by the manufacturer, ordinarily 130° to 180° at the outlet. It is better to lean towards higher temperatures than low ones, as it is generally recognized that excessive cooling, often resulting from excessive idling, intensify the danger of engine deposits, valve stickiness, air port clogging, and the propensity to smoke formation and unpleasant exhaust odor.

Therefore, in addition to the proper flow of cooling water, experienced operation is of extreme importance.

In large, stationary installations, a considerable saving can be accomplished by utilizing the heat carried away in the cooling water for heating purposes.

It is recommended:

- 1—Use clean water in the cooling system; chemically-treated, if necessary.

... And now please turn to page 74 ...

DIESELS *for* VICTORY

ALCO built the first U.S. Diesel locomotive and, with G.E. became a major pre-war builder of Diesel electrics. In the switching field ALCO led and road Diesels had begun to come from the shops in growing numbers when war started. This same type of ALCO Diesel for many years has been successfully serving Municipal power plants, pipelines, public utilities, office buildings, department stores, hotels, tankers, cargo ships, tugboats — Meanwhile ALCO Diesels are today hurrying from the testing blocks into the holds of America's fighting ships.

AMERICAN LOCOMOTIVE COMPANY
Diesel Engine DIVISION

30 CHURCH STREET, NEW YORK, N.Y.



MAINTENANCE PROBLEMS—Bearing Failures

By R. L. GREGORY*

A REPORT recently released by one of the big engineering firms discloses the fact that maintenance problems are on the increase in all phases of power equipment and prime movers. This, of course, is a natural result and is to be expected, since all of our equipment is being subjected to overloads, more severe strain, and replacement parts are not obtained as easily, due to diversion of materials to other vital work.

In line with this condition, this section of **DIESEL PROGRESS** will take up various problems of maintenance and devote articles to individual subjects covered by maintenance. We have had several communications on the subject as there seems to be an increase of bearing failures. The following causes are usually responsible for bearing failure:

- a. Presence of foreign material in the bearings.
- b. Incorrect fitting of bearings.
- c. Insufficient clearance for oil film.
- d. Failure of oil supply.
- e. Service and overload fatigue.
- f. Poor babbitt and improper bonding.
- g. Condition of crank or rods.
- h. Improper oil.
- i. Shaft alignment.
- j. Electrolysis.

Many bearing failures are caused by foreign materials embedded in the babbitt itself carried in by the lubricant as suspended matter, or found between the bearing shell and the liner. You have all noticed at times dark spots of foreign material on the shiny surface of a bearing, either loose or embedded in the babbitt metal itself. These particles, if investigated with a strong microscope, often turn out to be grit, metal particles, slag, or hard carbon. If they turn out to be grit or slag, in all probability they are the result of carelessness in the handling of the babbitt when the bearing was poured.

If they are metallic particles, they are probably

* Chief Engineer, Municipal Water and Light Plant, Hillsdale, Michigan.

the result of worn moving parts or, if carbon, probably come from operating conditions and are carried in to the bearing by the oil stream. They may also be the results of not carefully cleaning the crankcase after erection or overhauling jobs. Once they get into the bearing, they become embedded either in the babbitt,

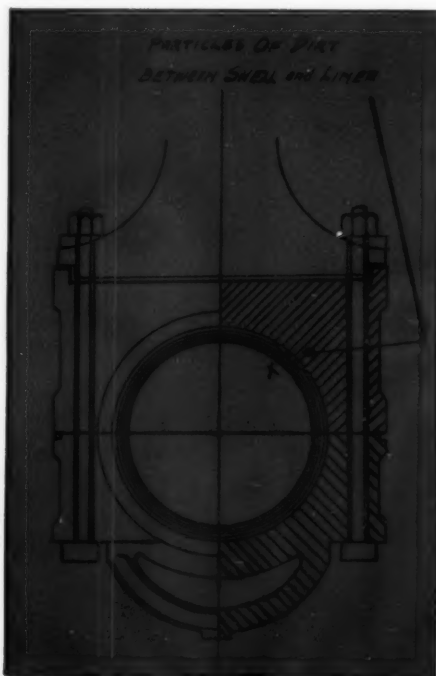


Fig. 1

or adhere to the crank or rod, and in operation set up excessive friction, causing heat.

Fig. 1 shows the result of dirt particles left between the shell and liner, when the liner was installed. If the shell is not thoroughly cleaned before installing the liner, and particles of grit or metal are left either on the shell or the back of the liner, then the liner does not have a proper seat on the shell with the result that an air space is formed around the particles of foreign matter between the shell and liner. This air space acts as an insulator and does not allow for the free dissipation of heat from the liner through the shell. This heat being retained at this particular part of the bearing develops a "hot spot" at the point X with the

result of either cracked babbitt or the start of a wiped liner if not discovered and taken care of. This, of course, is caused by excessive expansion of the babbitt at this particular point. In pouring bearings, therefore, or installing babbitt liners, exercise great care in seeing that all foreign particles are removed, crank cases and oil lines kept clean, and use clean oil.

Incorrect fitting of bearings is another cause of bearing failure. In fitting up a bearing, most manufacturers have definite data on the tolerances which are to be used in both the vertical and horizontal fits. A good rule to follow is to allow .001" clearance for each inch of shaft or crank diameter. Another point to observe is to have at least 75% bearing surface when installing a new bearing or liner. Be sure that your crank or rod is free from scores, removing same with a good oil stone, and also see that no particles of old babbitt still adhere to it when installing a new bearing.

Insufficient clearance for oil film reflects back to the fitting of the bearings. A positive oil film must be maintained between the bearing and the crank or rod, in order to overcome friction and lessen the heat. If your bearings do not have this space, the oil film is wiped off, and when you do this and get a metal-to-metal contact, the result is disastrous. You might compare the globules of oil to minute rollers, working between the crank and liner, or the rod and bearing, thus preventing the metal-to-metal contact, but these globules must have sufficient space to maintain their form in order to get proper lubrication.

Failure of oil supply does not mean that you haven't sufficient lubricant in the system. There is no prevention for some amount of condensation forming in oil operating at varying temperatures. When this becomes excessive and an emulsion is formed, the oil carrying pipes become clogged with a sludge which must be removed from time to time. This sludge has a tendency to restrict the free flow of the lubricant, either by clogging screens, filters, oil lines . . . And now please turn to page 68 . . .



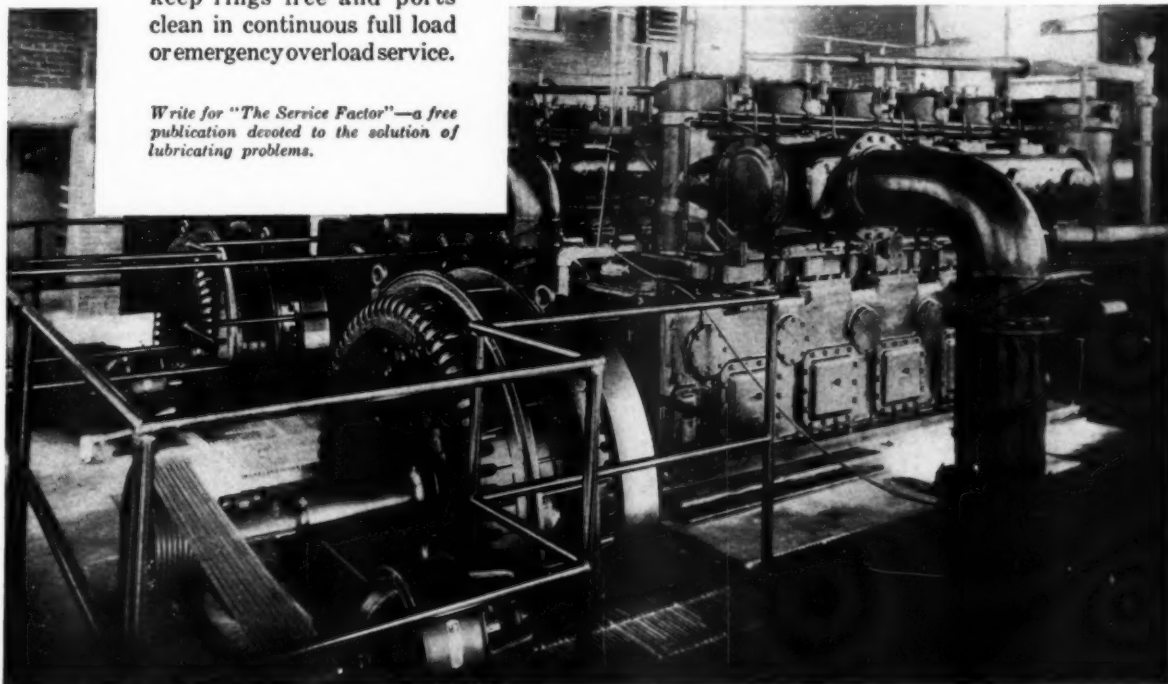
REPLACEMENTS

are as big a problem *at home* as at the Front. Avoid replacement problems and preventable shutdowns in DIESEL operation by using

.....SINCLAIR RUBILENE OILS.

Rubilenes have high wear-preventive film strength, and sludge resistant qualities that keep rings free and ports clean in continuous full load or emergency overload service.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.



SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

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ATLANTA

FAIR BUILDING
FT. WORTH

IT'S ONLY A LITTLE JOB BUT DON'T NEGLECT IT

So simple and so few are the service requirements of Twin Disc Clutches and Clutch Power Take-offs that they are often overlooked until *real* trouble—trouble which could have been prevented—"ties up the works."

Don't let this happen to your clutch. Don't fail to:

1. Lubricate it regularly. Your Twin Disc Clutch is lubricated from an easily accessible point: a grease cup fitted to the throw-out collar which needs only a turn or two. The Clutch Power Take-off collar should be lubricated *once a day* before starting work; the ball bearings every 50 hours of running. Pilot bearing is lubricated through drilled shaft.

2. Adjust it properly. Turn clutch until adjusting pin can be reached. Pull this pin out and turn adjusting yoke clockwise until operating lever requires a distinct pressure to engage. For adjustment of the Clutch Power Take-off, remove hand hole cover and turn clutch until adjusting lock pin can be reached. Then proceed same as with clutch.

Regular inspection on these two maintenance points will assure maximum performance and a full working life with minimum parts replacement and service for your Twin Disc Clutches. **TWIN DISC CLUTCH COMPANY, Racine, Wisconsin.**

Illustrated below: Left, Twin Disc Clutch Power Take-off for engines having up to 285 hp. output. Sizes: with single plate clutches, 6½" to 24"; double plate, 11½" to 18". Housing sizes: No. 6 S.A.E. to No. 00 S.A.E. Right: Twin Disc Model E Clutch, heavy-duty, enclosed type. Sizes 14" to 42" in single or two-plate assemblies.



TWIN DISC
CLUTCHES AND HYDRAULIC DRIVES
REG. U.S. PAT. OFF.

Supervising and Operating Engineers' Section

... Continued from page 66 ...

or check valves. Failure of oil supply is rarely due to pump failure, if the proper inspection of your pumps is maintained. Good oil properly filtered and cared for, clean carrier passages, and maintaining the proper crank case level will reduce chances of bearing failure.

Service and overload fatigue is likely to be one of the greatest causes of bearing failures during our present conditions of operation. There is hardly a unit in the country today which is not being operated at loads in excess of those carried at normal times. When a Diesel is installed, the manufacturer has designed it throughout for certain specific performance duties which are clearly outlined in the engine specifications. Bearings are designed to carry a certain load without undue stress and strain. With our present demand on power equipment, many units have been called upon to carry overloads, some have been speeded up, all of which tends to throw additional strains on the bearings. Where this condition has occurred, strict vigilance over your bearings must be maintained and, in case fatigue does begin to appear, the manufacturer should be consulted on the matter.

Poor babbitt and improper bonding, we often find, are causes for bearing failures. When pouring new bearings on shell liners, great care must be exercised in the quality of babbitt used. A babbitt with the proper tin base is much to be desired but, due to the scarcity of tin, more lead is being used in babbitts manufactured today. A lead base babbitt must be carefully watched. When using reclaimed babbitt, great care should be exercised in removing any foreign particles, metallic or otherwise, grease and oils. The shell should be thoroughly cleaned and on small bearings it is well to scrape or take a fine machine cut off the surface and tin the shell before pouring the babbitt. When liners are to be installed in shells, remove all dirt from liner back and shell face.

As pointed out by Mr. A. B. Willi of the Federal Mogul Corporation in his paper before the Oil and Gas Power Conference last June, many discolored bearings are wastefully thrown away each year and, while discoloration may indicate corrosion, in many cases it is harmless. Discoloration is more likely to appear in lead base babbitts than in a tin base babbitt, due to chemical reactions of the oil on the bearing.

Methods of processing bearings have greatly improved in the last decade and consequently

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this cause of bearing failure is not as frequent as in former years. Any engineer, however, making his own bearings and shells should fully realize the necessity of using good babbitt and properly preparing the shell for pouring.

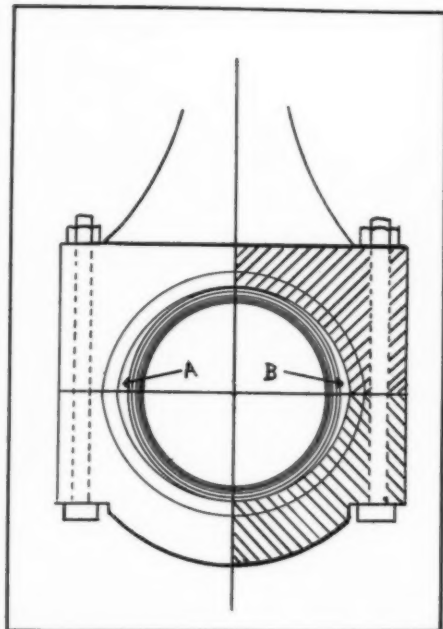
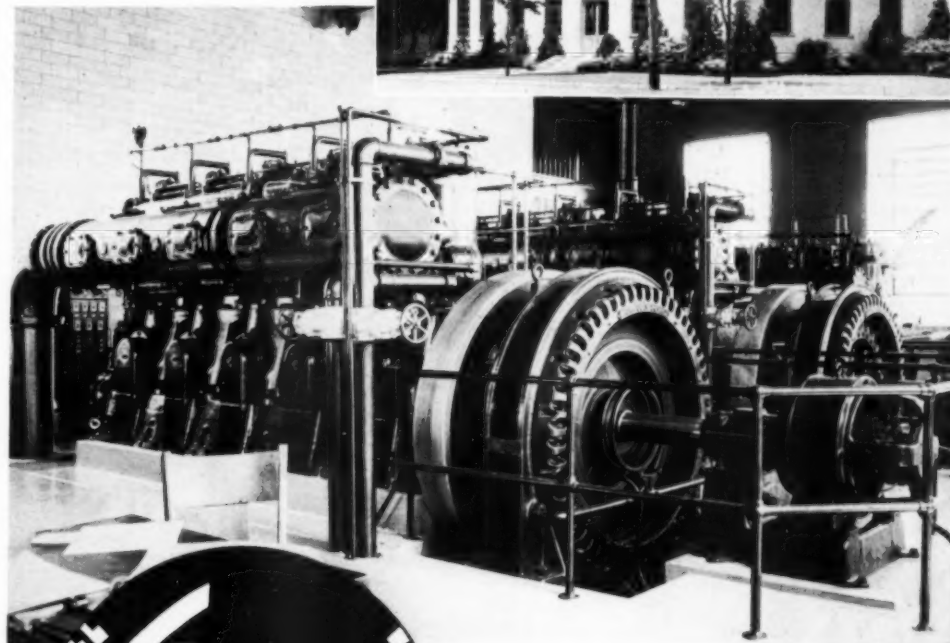


Fig. 2

In the installation of new bearings to cranks and rods, special attention should be given to the condition of those rods and cranks. It is useless to expect a bearing, regardless of the material from which it is constructed, to stand up under operating conditions if the crank or rod surfaces are out of round, scored, or otherwise unfit. Along with this condition, care must be taken to tighten properly the parting bolts between the shell halves. Fig. 2 shows what will result to bearings where the proper tension is not maintained on these parting bolts. The bearing spreads out allowing a heavy film of oil to form at the points A and B. This is not conducive to proper heat dissipation.

I fear that too many engineers are prone to jump to conclusions when they have bearing failures, and immediately blame it on their lubricant. All of the standard lubricants used by the Country's industries are good. If they were not, they would not be used. But there is such a thing as misapplication. Lubricants are the subject of extensive research at all times, and the lubricating engineer of your oil vendor should know what lubricant is applicable to your especial requirements. If you are following his instructions and using the proper grade of oils, taking the proper care of it in the way of filtering, and having it periodically analyzed, in all likelihood the oil is not to blame. Of

in the Zeeland, Michigan, modern municipal power plant, shown here, one 2130 hp. and two 690 hp. Fairbanks-Morse Diesels are amply satisfying the Dutch-American community's idea of thrift. And, in keeping with the ever-alert supervision exercised in this plant, each Diesel is protected by "Alnor."



Assures Performance

The same in-built accuracy and dependability, that have won undeniable acceptance for "Alnor" as an accessory to successful Diesel operation, are now rendering "Alnor" pyrometers indispensable to Diesel performance in fields that we cannot mention. Meantime, thousands of Alnors are protecting vital Diesel installations, behind the lines, throughout this Country.

Specify and Buy "Alnor"



Illinois Testing Laboratories Inc.

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MANUFACTURERS OF "ALNOR" AND PRICE INSTRUMENTS • PRODUCTS OF 42 YEARS' EXPERIENCE

course, there are exceptions to all rules; the same applies here. If plant conditions, loads, etc., change and he is not aware of them, the oil he has previously recommended may not stand up under these changed conditions. This so often proves to be the case, and then the oil is blamed.

Use a good grade of lubricant, maintain it properly, and if you have any change in operating conditions and your oil shows signs of disintegration or fatigue, consult your lubricating engineer; it's his job to advise you as to

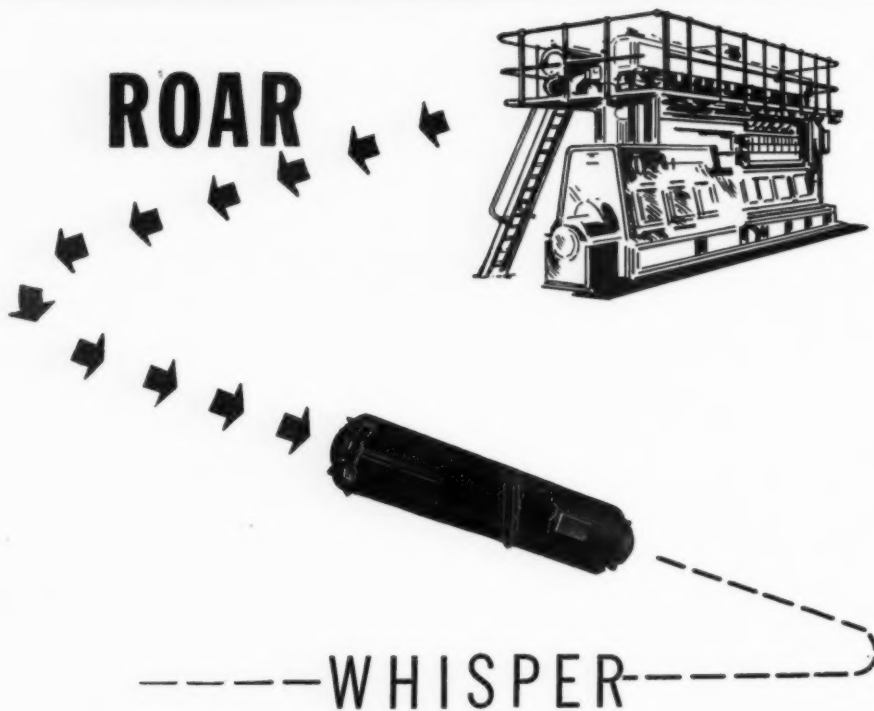
any changes. Have your oil tested and analyzed frequently.

Shaft alignment is also a source of bearing failure. Shaft alignment is bound to change from time to time, due to wear, service of the unit, foundation conditions, and other operating practices. By use of a strain gauge and trams, this alignment should be checked at least annually and a record of these changes noted. Change in shaft alignment may throw undue strain on particular bearings, hence causing them to overheat. Shaft alignment has been

known to change as much as .010" in a six months' period of operation without undue heating but, in instances of this sort, the condition should be corrected as soon as possible, because you are reaching the danger point.

Bearings in rare instances have failed due to electrolysis. This generally occurs where the unit is direct connected to electrical equipment. It can be detected by a pitting action on the bearing and is usually caused by some part of the electrical equipment becoming grounded to the shaft. I recall one instance where a fibre bushing, used to insulate a collector ring from the lead through which it passed, had become cracked, allowing the current to ground on the shaft, which caused pitting and heating of the bearings. In another case, the lead wires from the collector rings to the stator were insulated from the shaft by mica and linen tape wrappings and the leads held in place by brass clamps properly insulated. One of these clamps came loose, allowing a movement of the leads on the shaft. This movement gradually wore through the mica and tape insulation and grounded to the shaft, causing electrolytic action on the bearings, which eventually ruined one of them before the trouble was discovered.

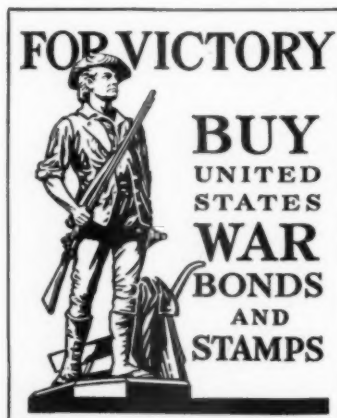
Much more could be said on bearing failures and the foregoing causes elaborated upon. But when you detect bearing trouble, most of the foregoing will cover the cause of that failure. But, in following your maintenance work, watching for these points on your inspections, you can eliminate most bearing troubles. With conditions of operation and the inability to course, there are exceptions to all rules; the same applies here. If plant conditions, loads, etc., change and he is not aware of them, the secure ready replacement of parts, as they exist today, each and every engineer connected with Diesels and power equipment must evaluate time and concentrate on these problems in order to keep up vital production.



Maxim Silencers on the exhaust of Diesel engines can make exhaust roar inaudible within a few feet of the end of the tail pipe.

This cancellation of a major noise factor contributes importantly to better working conditions . . . less distraction of workers. In addition, Maxim Silencers help make your plant a "good neighbor" by eliminating the penetrating, "sleep killing" racket of exhaust thump. Remember, even during the day now, people who live near your plant, your own night shift men perhaps, are trying to sleep. Give them a break . . . with Maxims.

THE MAXIM SILENCER COMPANY
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New D. C. Stack Switch

A NEW direct-current stack switch which is not affected by extreme vibrations or by the "roll and pitch" encountered in marine installations was recently announced by Penn Electric Switch Co. of Goshen, Indiana. Designated as the Type 648 for intermittent ignition and Type 647 for continuous ignition, these stack switches feature "positive arc blow-out."

According to the manufacturer, positive arc blow-out assures protection against excessive arcing and provides long contact life. The load current passes through the arc-blow-out coil which surrounds a soft iron core to create a magnetic field and thus literally "blow out" the arc between the contacts.



In addition, outstanding features of design and construction include: Automatic lockout in case of combustion or flame failure; automatic recycling if power fails (does not lock out); short, responsive, wide-range helix; super-power relay and combustion contacts operate efficiently regardless of control mounting position; trip-free lockout switch, cannot be blocked in closed position.

Type 647 and 648 D.C. stack switches are fully described and illustrated in Bulletin 1943, available free, upon request to Penn Electric Switch Company, Goshen, Indiana.

C. Lee Cook Manufacturing Co. Appoints T. V. Sords

C. LEE Cook Manufacturing Co., Louisville, Kentucky, announces the appointment of T. V. Sords as its representative in Cleveland to succeed the late Fred M. Harmon.

Mr. Sords has his office in the N.B.C. Building, and has long been active in marine circles.

REDUCE ENGINE TROUBLES

Value of MICHIANA Principle of Oil Filtering Well Established



Model 19800 MICHIANA Lube Oil Filter (653 H.P.) has four standard filter elements. Other sizes have one, three, six, seven and 10 elements.



Filtering element—can be either the Re-Packable type or Thru-way Replaceable type. Used in all Filters from 163 to 1633 H.P. capacity.

To be sure of clean oil, properly engineered and designed Filters of adequate capacity for the engines are now available. Through long years of Filter manufacturing, through close cooperation with engine builders,—through the experience gained in actual application of tens of thousands of Filters, MICHIANA offers a practical solution,—a line of Filters to meet the exacting demands of today.

The practical value and the dependability of the MICHIANA principle of oil filtering have been well established. MICHIANA Filters have been given high rank by prominent engineers and by operators of engines used on streamline trains and switch engines,—on trucks, tractors

and construction machinery,—on tankers, tenders, destroyers, speed boats, tugs, tow-boats, barges and all types of Naval and Merchant Marine vessels.

Filter Elements Interchangeable

Single Filters are made in capacities up to 1633 H.P. and may be used in groups for various other capacities. All filter elements used in filters from 163 to 1633 H.P. are alike, being used singly or in sets of three, four, six, seven and ten according to capacity. Where Filters of different capacities are used the stocking of spare elements is thus simplified.

Elements are available in either the Re-packable Type for lowest possible maintenance cost,—or the Replaceable or Cartridge-in-a-can Type for quick servicing. With this type the used cartridge is removed and another placed over the center tube of the filter.

For full power,—for lube oil conservation,—for less maintenance and better all-round performance, and fewer shut-downs, keep your engines clean with MICHIANA Filters . . . Write for new Bulletin 42-D. MICHIANA PRODUCTS CORPORATION, Michigan City, Indiana.



Pair of 17400 Filters on common bracket, Filter Element, and single 17400 Filter. No. 17400 (50 H.P.), is 15 1/2" long; No. 17500 (100 H.P.), 24 1/4" 17600 (150 H.P.), 33 1/2". All shell diameters, 7 1/4".

MICHIANA OIL FILTERS

Exchange Your Diesel Maintenance Ideas

Continued from page 62

In making up such a connection, a great deal of care must be exercised to see that the pipe "D" is straight at the point of contact with the throat. Then care must be taken in pulling up the cinch nut to avoid cutting the pipe with the cinch ring at the point designated as "C." If this cinch ring is pulled too tight and there is the least vibration to the coil, the pipe becomes crystallized at the point "C" and cracks

with a result that air leaks into the cooling water while operating and, as soon as the unit is shut down, the process reverses and the water seeps back into the air pipes.

If this condition arises and is not taken care of immediately, pitting develops in the casting at the throat, at points represented by the dark areas, and then it is almost impossible to obtain a perfect air tight joint between the air pipe and the throat and further maintenance measures must be taken.

One of the best methods to assure a tight fit, at the point of the pipe contact with the throat, is to adopt the following practice: Your cooler should be examined periodically for leaks. In this examination, the cinch nuts should be removed, thus allowing for removal of the cooling coils. Each coil should be carefully examined at the point of contact, between the cinch ring and pipe, on the external surface and also on the interior, to make absolutely certain that no crystallization or crack is developing.

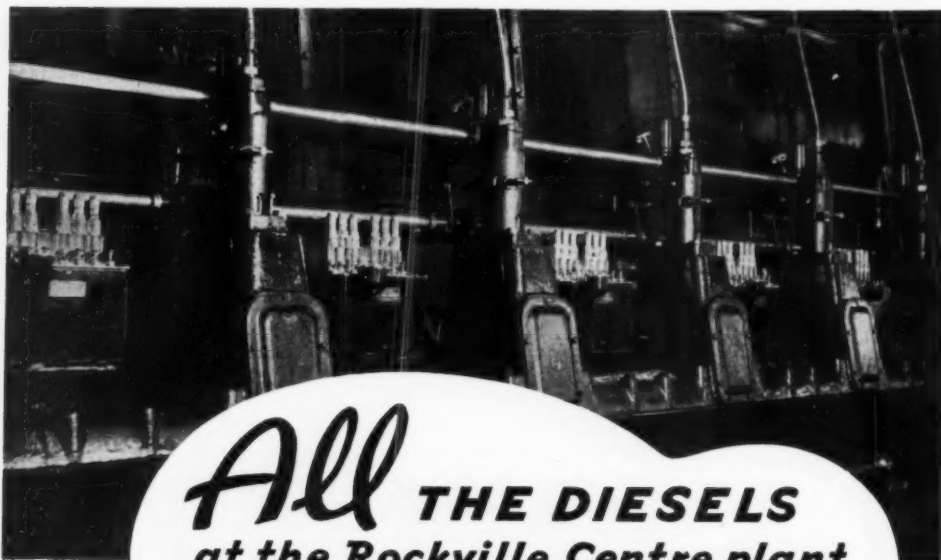
When this has been ascertained, before replacing the coil, you should have a reamer of the same degree of pitch as the throat of the casting. This reamer should have a guide nut, threaded the same as the cinch nut. Place the reamer in the throat and hold it firmly in place by the guide nut. Then, by means of either a tap handle or wrench, slowly ream out the throat until you are certain that all rust and pitting has been removed and you have a clean smooth surface with which your cooling pipe can make contact. This eliminates any guess work in the matter of an air tight joint at this point.

There is a probability that most plants do not have such a reamer in their equipment of tools. Where this is the case, the proper reamer can invariably be obtained from the cooler manufacturer, if he is given time to get it to you before the inspection is made.

After your cooling coils have all been gone over in this manner and reinstalled, a hydrostatic test of approximately one and a half times the amount of blast or starting pressure should be given the assembled unit. If regular testing equipment is not available, the next best method of testing is to block off the various stages of the cooler, with blank flanges, and connect your starting air line to the cooler.

Cover each cinch nut with a good heavy solution of soapsuds, and gradually let the starting air pressure into the cooler, throttling it with a good valve for the various stages, the high stage, of course, being given full pressure. If you want to check the exact pressure with which you are testing, put a gauge on one of the blocking flanges.

This method will tell you whether you have any leaks, since in practically all cases where there is not an air tight joint at the point of contact between the cooling pipe and the throat, the air will leak by the threads in the cinch nut and a soap bubble will develop showing the



All THE DIESELS
at the Rockville Centre plant
rely on **MANZEL**
Force Feed **LUBRICATORS**

One of the most important Diesel power plants in the country is that at Rockville Centre, N. Y. It is equipped with McIntosh & Seymour and Nordberg Diesels, every one of which depends exclusively on Manzel Force Feed Lubricators for cylinder and bearing lubrication.

More than 40 years' experience in building all types of force feed lubricators is back of every Manzel. Their simple design and sturdy construction give them a dependability that hundreds of manufacturers find invaluable. There is a Manzel model and type to fit every Diesel requirement.

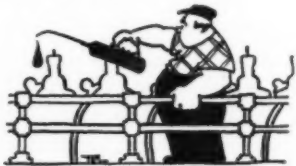
The more important the installation, the more apt you are to find Manzels handling the lubrication job.

Write for Catalog 94-B

MANZEL BROTHERS COMPANY
275-277 BABCOCK ST., BUFFALO, N. Y.

leak. This method, of course, does not allow for one and a half times the starting air pressure except on the lower stage coils, but if they stand the full starting air pressure, they undoubtedly will be air tight at the joint.

This method has been used by several engineers and is passed along to Engineers and Operators who have experienced trouble with leaky coils in their air coolers.



Oakite Issues "Wartime Maintenance Digest"

THE "Wartime Maintenance Digest" describes how new, time-saving degreasing materials, descaling methods and related cleaning techniques are effectively helping Diesel operators successfully solve the problems of shortening equipment down-time, conserving manpower, and stepping up efficiency in handling a wide range of vitally important, commonly recurring



equipment maintenance, plant housekeeping and sanitation jobs. On each of the forty-one different cleaning or related jobs discussed, this wartime maintenance guide outlines in data sheet form for quick, convenient reference (1) the material used, (2) method followed, (3) time saved, (4) fire or other hazards eliminated, and (5) other advantages gained essential to increasing operating efficiency as well as securing greater output and longer service from Diesel engines, lube oil and jacket-water coolers, refrigerant condensers, water-cooled compressors, feedwater and fuel oil heaters, surface condensers, and other types of heat exchange equipment. Copies of this digest are available free on request to Oakite Products, Inc., 57 Thames Street, New York.

West Coast Diesel News

DIESELS for fishing boats, continues to be the order of the day. Captain M. O. Medina, owner of the 150-ft. *Normandie*, largest of the tuna clippers, has repowered his short-range fishing boat *Anna K* with a 6 cylinder, 120 hp. Caterpillar. Both vessels are of San Diego, California, registry.

THE Los Angeles office of Fairbanks-Morse Co. reports the sale of a 160 hp., 4 cylinder.

10 in. by 12½ in. marine Diesel to the French Sardine Co., Terminal Island, California, for repowering their 75-ft. seiner *Harmony*.

TWO new 65-ft. water taxis for the H-10 Water Taxi Co., San Pedro, California, have been completed by John Harvey's Long Beach Boat Shop. Powered with 120 hp. Cummins Diesels with 3 to 1 reduction gears giving a speed of twelve knots, their capacity is 197 passengers to and from Terminal Island shipyards.



SIMPLE • FAST • ACCURATE



The PREMAX is perfectly suited for operating men. No skill, scaling of diagrams, or calculating required. Pressure is read instantly, directly from the scales. Precision-built by Bacharach (Est. 1909) the PREMAX gives accurate readings at all engine speeds. It is easily attachable to any Diesel.



BACHARACH INDUSTRIAL INSTRUMENT CO.
7000 BENNETT STREET • PITTSBURGH, PA.

DIESEL POWER PLANT

SAVES \$7300 PER YEAR

AS RESULT OF USING A

Direct-Reading

PREMAX
Engine Pressure
INDICATOR

A performance survey made in an important western power plant demonstrates again that the PREMAX Pressure Indicator is an amazingly effective aid in maintaining Diesel engine efficiency. The comparative data obtained before and after using the PREMAX reveals that output has increased approximately 1 kw-hr for each gallon of fuel consumed. This improvement in fuel economy represents an average annual savings of \$7300.00.

Sustaining peak performance of any Diesel engine requires maintenance of proper firing and compression pressures. The direct-reading PREMAX Indicator provides a way to observe these pressures that is unsurpassed in convenience, speed, and accuracy. Its regular use simplifies the job of properly adjusting and balancing pressures, assuring more even distribution of the load over all the cylinders.

Case studies invariably prove that the PREMAX Indicator pays for itself many times over through fuel and maintenance savings effected. Return coupon for full particulars.

SEND ME PREMAX BULLETIN 283

Name _____

Address _____

City _____ State _____

We Operate _____

No. Cylinders _____ H.P. _____ R.P.M. _____

FIVE 112 hp. Caterpillar Diesels have been installed by Basic Magnesium, Inc., at their mine at Luning, Nevada. They will furnish power for Worthington 350 cu. ft., compressors supplying air for hand and wagon drills.

FOR repowering the seiner *Bessemer*, the Van Camp Sea Food Co. Inc., Terminal Island, California, has purchased a Fairbanks-Morse, 5-cylinder, 10 in. by 12½ in. marine Diesel; direct reversible and rated 200 hp. at 400 rpm.

THE 118-ft. tuna clipper *Southern Cross* is getting a repower job by Fairbanks-Morse Co. The new Diesel for this Coast Fishing Company-owned vessel is a 4-cylinder, 8¾ in. by 10½ in. 120 hp. at 450 rpm. Rejuvenation also includes F-M motors and pumps. Her home port is Los Angeles harbor.

THE M.G.L. Mining Corp., Fernley, Nevada, has purchased from the Shepherd Tractor and Equipment Co., Los Angeles, a Caterpillar

Diesel tractor with La Tourneau bulldozer for road maintenance, and another "Cat" with traxcavator for truck-loading of ore.

SUNMAID, the 80-ft. San Diego, California, fishing vessel owned by The Sun Harbor Packing Co., has been given two new Buda Diesels—a 60 hp., for bait pump service, and a 90 hp. Buda Diesel for standby power service. Her main engine is a 200 hp. Enterprise.

R.F.D. Extraordinary

. . . . Continued from page 41

passengers and usually going 65 miles up, returning the same day. I have only one man employed besides myself.

"In May and June, we have tons of wool to be brought back down river. At this time of the year, we 'run' continuously every day either coming or going or making an excursion trip. We 'run' all the daylight hours at this time and get very little rest.

"For the first fifty miles my helper operates the boat, (this is during wool time only) and I get a little sleep and rest. From that time on, I am at the wheel until we get back to Lewiston. "The boat is fifty-eight feet long, of all steel construction, made in a very sturdy manner. It is of twelve foot beam and draws about 3½ feet of water. The boat is powered with two Gray Marine Diesels of 82 hp. each with 3 to 1 reduction gears turning a 25 in. dia. 38 inch pitch propeller 600 rpm. We might add that these engines, since I have installed them, have run approximately 3000 hours. They have cut my operation cost over gasoline 75%, and have given me no trouble at all. These Diesels run so nice, (and the river route is a very, very difficult 'run' to make) that after I first start them, they require absolutely no attention on the complete trip."

The Saturday Evening Post kindly permitted us to quote from Richard L. Neuberger's splendid portrayal in an effort to give the readers of DIESEL PROGRESS more of this picture than Kyle McGrady's modesty would permit him to tell. Yes, Mr. McGrady, it is a very, very difficult route and you are a brave man.

An Ounce of Prevention . . .

. . . . Continued from page 64

- 2—Check Radiator and water passages at frequent intervals for leaks or obstructions.
- 3—Check oil-cooler, if any, at regular intervals.
- 4—Avoid excessive idling and too low engine temperatures.



Young MARINE DIESEL COOLING UNITS

Modern research and testing laboratories . . . a competent staff of engineering specialists . . . complete manufacturing facilities . . . these are the vital reasons behind the high efficiency and exceptional performance records of YOUNG Marine Diesel Cooling Units and the complete line of heat transfer equipment for all types of stationary

and mobile Diesel Engines. YOUNG's reputation for sound engineering and exacting research is your best guarantee of the right cooling unit, built to the rigid specifications of your requirements. Why not benefit by the quarter-century of heat transfer experience back of YOUNG products? YOUNG engineers will be glad to help you.

YOUNG RADIATOR COMPANY

Dept. 232-M, Racine, Wis., U. S. A.



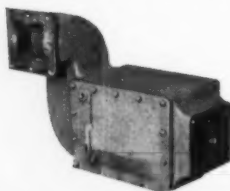
Young Tube and Bundle Heat Exchanger

The YOUNG marine heat exchanger above incorporates superior YOUNG-designed features of construction. Available in a wide range of sizes, and models for salt or fresh water use.



Young Heat Exchanger

This YOUNG marine type unit combines the dual functions of engine jacket water and lube oil cooling into a single unusually compact assembly. Tube nest is easily cleaned.



Young Supercharger Intercooler

In this cooler developed for high speed engines, water circulates through a special design, high efficiency core to cool super-charged air flowing around tubes and fins.



Young Combination Heat Exchanger

This YOUNG designed combination heat exchanger and lube oil cooler for marine use incorporates unique automatic temperature controls of jacket water and lube oil.

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CALMES ENGINEERING COMPANY
NEW ORLEANS, LOUISIANA

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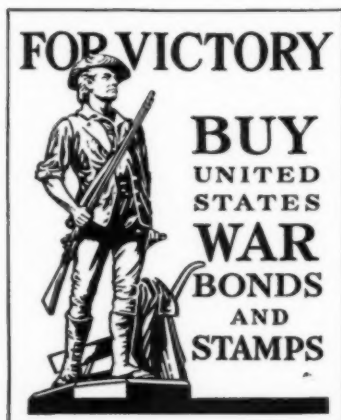
HEAT TRANSFER PRODUCTS
OIL COOLERS - GAS, GASOLINE, DIESEL ENGINE
COOLING RADIATORS - INTERCOOLERS - HEAT
EXCHANGERS - ENGINE JACKET WATER COOLERS
UNIT HEATERS - CONVECTORS - CONDENSORS
EVAPORATORS - AIR CONDITIONING
UNITS - HEATING COILS - COOLING COILS



It is concluded that "a modern Diesel engine will operate efficiently and smokelessly and have a remarkable longevity, providing it is maintained in a satisfactory mechanical condition, providing the correct Diesel Fuel and Lubricant are used, and providing the operator knows how to handle his engine correctly."

A satisfactory mechanical condition can be assured by the adoption of a systematic plan of preventive maintenance, including inspection, testing and cleaning of the various parts along the flows of: air-fuel-lubricant and water, and a periodic renewal of lubricating oil.

Every manufacturer has available a booklet of instructions containing all the information necessary to prepare such a plan of maintenance, adapted to his particular engine and to the type of work to be accomplished. It is suggested that these instructions be studied and a routine of inspection and cleaning decided upon.



Thomas D. Bowes Resigns From Penn-Jersey Shipbuilding Corporation

THOMAS D. BOWES, M.E., designer of the Bowes' type cargo ships, announces his resignation as President and Director of Penn-Jersey Shipbuilding Corp. of Camden, New Jersey, in order to devote more time to his consulting practice. Mr. Bowes is consultant for Barnes-Duluth Shipbuilding Company, Nashville Bridge Company and Army Engineer Department, and will continue to act as consulting Naval Architect and Engineer for Penn-Jersey Shipbuilding Corporation.

Booklet On Conservation of V-Belt Drives

A BOOKLET entitled "23 Ways to Conserve the Life of Your Multiple V-Belt Drives," prepared by the Engineering Research Bureau of

the Multiple V-Belt Drive Association is now available. This book is the Association's contribution to the rubber conservation movement and its sole purpose is to educate power users in the proper procedure of selection, installation, and maintenance of their Multiple V-Belt Drives—in order to obtain the maximum life from every V-Belt.

This work is not an academic engineering hand book, but rather a primer on the subject,

written and illustrated in a simple, easy-to-understand manner. It is in no sense advertising matter or propaganda, and is offered free of cost to all who request it. It is designed to help reduce needless waste of rubber in the present emergency.

Requests for "23 Ways to Conserve the Life of Your Multiple V-Belt Drives" should be addressed to Multiple V-Belt Drive Association, 140 S. Dearborn St., Chicago, Illinois

Pump Aids of 1942

BULLETINS BY BLACKMER FREE

TO USERS OF ROTARY PUMPS

Your "pump file" IS NOT COMPLETE without them.

FACTS ABOUT ROTARY PUMPS

Design and operating data on swinging-vane type pumps. Ask for Bulletin 301.

PUMP ENGINEERING DATA

Quick answers to pumping and piping problems. For Engineers. Ask for Bulletin 302.

BLACKMER ROTARY PUMPS

A 24 page catalog illustrating types of hand and power pumps for various industrial uses. Ask for Bulletin No. 130.

ENGINEERING BULLETINS

Covering many specific liquid-handling problems. Issued frequently by the Blackmer Engineering staff. May we add your name to the mailing list?

HOW TO MAKE PUMPS LAST LONGER

The 10 Commandments of rotary pump maintenance. Card punched to hang near pumps. Ask for SER-1.

Power Pumps: Capacities 5 to 700 GPM. 300 psi.

Hand Pumps: Capacities 7 to 25 GPM. 54 models.

Blackmer Nation-Wide Pump Engineering Service awaits your call on any problem involving rotary pumps.

Write Blackmer Pump Company, 19612 Century Ave., S.W. Grand Rapids, Michigan



American Locomotive Company Sponsors Engineer Railway Diesel Shop Battalion

SPONSORSHIP of the 762nd Engineer Railway Diesel Shop Battalion, United States Army, by the American Locomotive Company has been accepted following an invitation to the company from the Corps of Engineers. The Secretary of War's approval to the affiliation was received by the company last week.

The suggestion that the company sponsor the Battalion was first made to President Duncan W. Fraser of American Locomotive Company by Colonel Lewis T. Ross of the Railway Branch, Troops Division, Corps of Engineers. Accepting the role of sponsor for the company, Mr. Fraser agreed that key personnel were to be recruited from within the company's ranks. It was also agreed that personnel would be drawn from all phases of the company's operations, even including clerical help, in order

to insure that there would be in the unit complete familiarity with every aspect of Diesel locomotive maintenance.

Major William Rogers is the senior officer in the Battalion. He was formerly a district service engineer for American Locomotive Company. Others from the company who have accepted commissions are Captain George F. McGowen, formerly a survey engineer, and Lieutenants Charles C. Davis, John D. Coleman, Myron A. Tenney and W. E. Sagstetter, all of whom were Diesel service engineers. Other personnel was drawn from General Electric, Westinghouse Air Brake and Electric Storage Battery companies. In each instance the men selected were specialists in some phase of Diesel engine maintenance. The Battalion has very recently been activated.

A Letter From Ralph Hemphill to Henry Kaiser About Diesel Aircraft Engines

USE of Diesel engines in the air to meet the threat of enemy bombers similarly powered flying at unreachable altitudes was urged by Ralph Hemphill in a letter recently sent to Henry Kaiser and Howard Hughes of Kaiser-Hughes, Inc.

Suggesting that Kaiser-Hughes make use of Diesels in their projected giant transport airplanes, Hemphill, who is president of Hemphill Institute of Technology and Aero Industries Technical Institute, said:

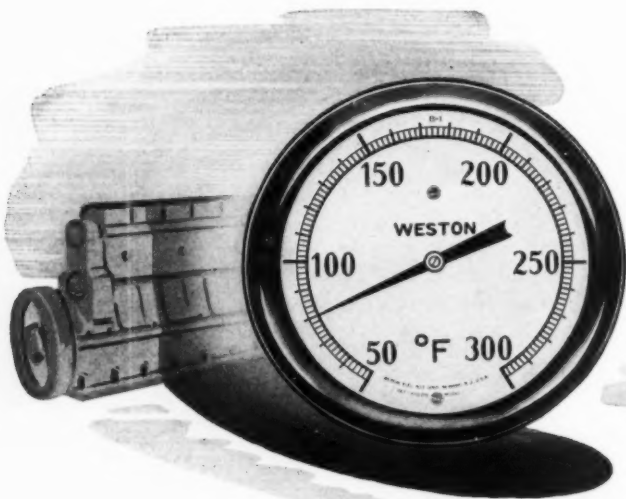
"A Diesel engine can be designed and built that will revolutionize power for the airliner of the future."

Hemphill's letter said in part:

"I am taking the liberty of calling to your attention the advantages which would accrue from the use of Diesels in your projected giant transport airplanes. Such a step, in my opinion, would be a tremendous contribution to aviation progress. As you know, Diesel engines now power the fastest means of transportation on land and sea—the streamline train and the Navy P T boat. Diesel engines could perform similar service in air transport.

"There is no question as to the efficiency and other advantages of the Diesel engine over the gasoline engine for power in the great airliners that you are contemplating. For many years we have known that Germany has had in use in their large ships the Junkers Diesel, giving them cruising radii that we have never been able to accomplish in this country.

THE ALL-METAL THERMOMETER



stands shaking up...without breaking down

The reason why the WESTON Thermometer can "take it" is found in its simplified, all-metal construction. There is but one moving element, and even that part is made of enduring metal. There is no gas or liquids... no capillary... no fragile members. Thus the WESTON not only resists ordinary breakage but it also stands up in applications where vibration is present... maintaining its high initial accuracy (within 1% over entire scale) over far longer periods. Available in types, sizes, ranges and stem lengths for Diesel and many industrial applications. Descriptive literature available on request. Weston Electrical Instrument Corporation, 579 Frelinghuysen Avenue, Newark, New Jersey.



WESTON all-metal temperature gauges are available in both angle and straight stem types; scale diameters up to 6"; stem lengths from 2" to 24".

WESTON All-Metal TEMPERATURE GAUGES

"We have, in my opinion, the best Diesel designing engineers in the world here in America. We also have the best facilities. Unless we start to build Diesels for our airships in the immediate future, we are liable to discover that one of these days the enemy is coming over with Diesel bombers flying so high that we cannot reach them. It is no idle imagination; it is very possible."

Hemphill said his suggestion was made in the interest of speedier victory in the war.

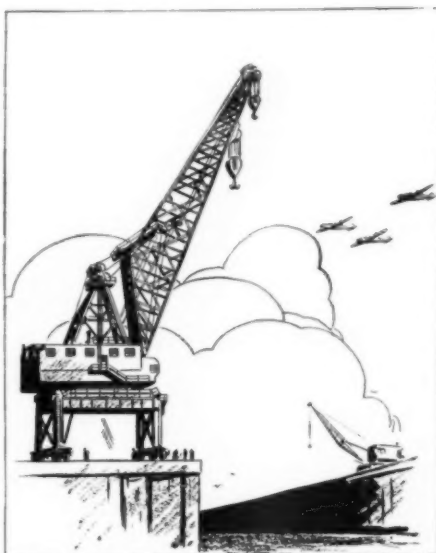
Diesel Engines Power Huge Navy Cranes

NINE huge cranes, whose booms reach into the air higher than a twelve-story building and whose Cooper-Bessemer Diesel engines exert tremendous power, are being constructed in Cleveland for the U. S. Navy, Bureau of Yards and Docks.

The cranes, some of the largest of this type ever constructed either in the United States or abroad, are being prepared in the shops of the Wellman Engineering Company and the R. W. Kaltenbach Corporation. The giants are of the drydock type, which will run on four rails and will be able to move rapidly on straight or curved tracks and thus become read-

ily available in any part of the shipyards where they are to be employed.

They will be completely self-contained and self-powered. The operation of each crane will be so simple and flexible that one man stand-



One of the nine huge Navy cranes completely self-contained and self-powered by a Cooper-Bessemer Diesel engine.

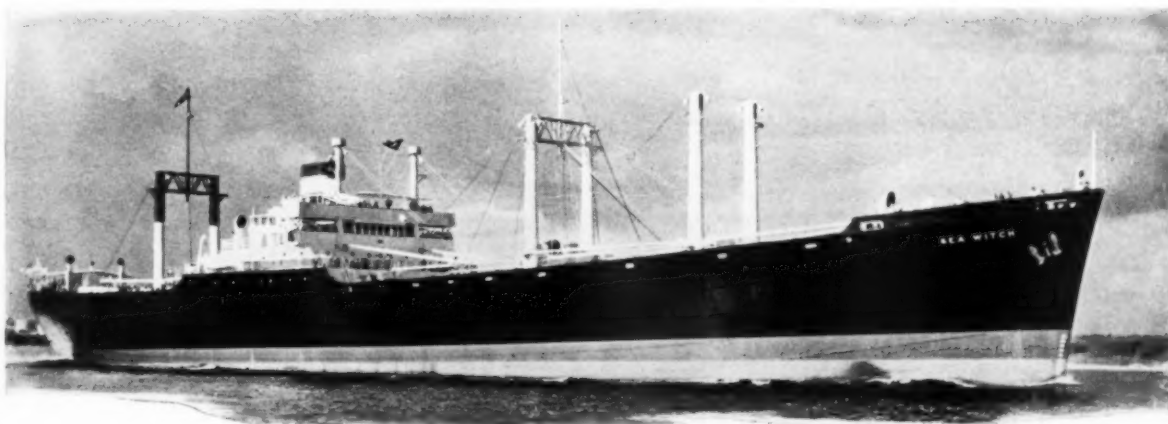
ing in the glass enclosed control room may direct it where he wants it to move by control

levers. On each crane, the machinery house, which is a part of the revolving superstructure situated high above the tracks, will have a floor area larger than that of a large one story dwelling.

One of the features of the power plant will be its compactness. Another will be its flexibility. Power will be supplied by the Diesel engine which will drive an electric generator, and current from the generator will drive the crane motors. This arrangement is similar to that of Diesel electric locomotives. Each crane will be self-powered to eliminate the use of conductors along the tracks. The Diesel engine as a source of power not only gives the advantages of compactness and flexibility, but it will be the most efficient source of power that could be obtained. The power plant will make each crane entirely independent of outside power sources, and enable it to continue its operation in the event of an emergency.

The cranes will also be equipped with auxiliary engines to supply lights and other applications for electricity incidental to hoisting operations.

In the event of an interruption of the power supply on the cranes, there will be means of providing electricity from outside sources.



Fluid Drives—On Duty!



American Blower Fluid Drives (Hydraulic Couplings) are on duty in war as in peace . . . They are in action on the fighting fronts and on the "industrial front"—absorbing shocks and torsional

vibration, preventing stalling of engines due to overload, enabling engines to start under no load and providing frictionless clutching and declutching.

Hydraulic Coupling Division
AMERICAN BLOWER CORPORATION
DETROIT, MICHIGAN

The revolving superstructure of each crane will be able to rotate in a complete circle. The crane will have two hooks, one main hook and one auxiliary. Nearly a half mile of cable will be used for the reeving of the hook blocks.

Rockville Centre

Continued from page 39

port government and reduce taxes. For several years, the annual contribution has been well above \$100,000 in cash and services. Another important dividend to the citizens has been repeated reduction in rates.

With the installation of the new Diesel, Rockville Centre is looking ahead to even greater production economy which will mean lower rates and lower taxes. The men responsible for power planning at Rockville Centre are Henry C. Major, Commissioner of Public Utilities, Wallace A. Payn, General Superintendent, W. E. Van Deusen, Chief Engineer, operating under the general supervision of Mayor E. T. Bleamish and Trustees W. J. Halliday, R. K. Atkinson, J. J. Hayes and G. S. Storms.

Rockville Centre is looking ahead to great load expansion after the war. At present, 30 per cent of production goes for such city services as street lighting, sewage and water pumping,

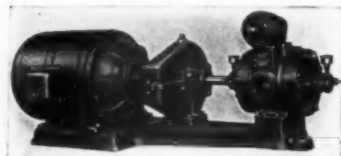
and virtually all the rest for domestic use and commercial lighting. This is entirely a residential community in the New York City industrial orbit and the cessation of home construction for the duration of the war means that the population of 20,000 is unlikely to increase. Consumption per capita is held down by the unavailability of new electric appliances. The East coast dimout has reduced peak loads below anticipated totals. But all these restrictive factors will be reversed when peace releases pent-up demand. Rockville Centre is a great Diesel plant today, both in size and efficiency. With a proven formula for operating success, the future holds even greater promise.

New Blackmer Steam-Jacketed Pump

A NEW AND very much simplified steam-jacketed pump has recently been put into production at the plant of the Blackmer Pump Company, Grand Rapids, Michigan, according to an announcement made by J. B. Trotman, General Sales Manager of the Company.

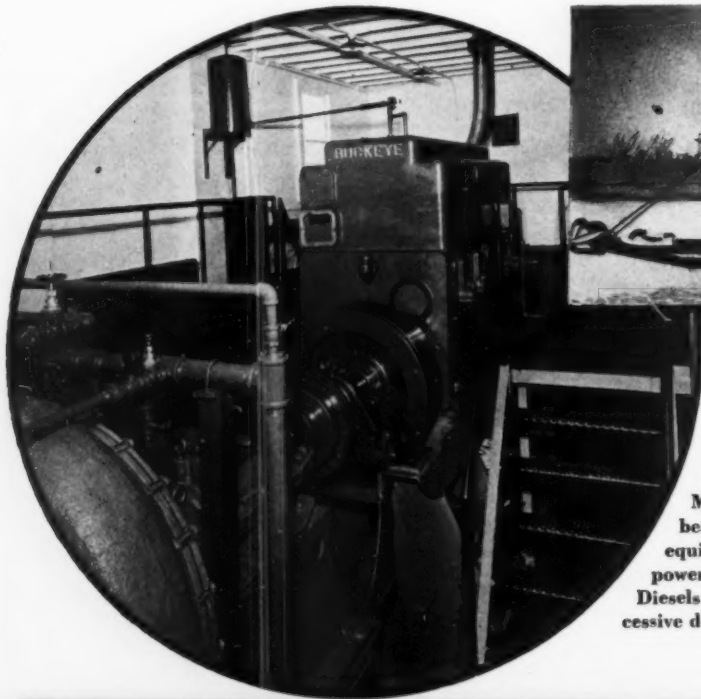
A number of these new units have been installed in war production plants for handling such materials as palm oil, lard, tar, greases and similar liquids that must be processed or

transferred while hot. The new steam-jacketed heads are made of cast semi-steel, with threaded intake and exhaust steam ports, and drain plugs. They are suitable of steam pressures up to 125 lbs.



The sleeve bearings supplied with these new pumps are rugged, grease lubricated, and located outside the pump casing away from the pumpage. This heavy bearing construction eliminates shaft whip and distortion. Pumps for pressures in excess of 100 psi. are furnished with anti-friction bearings. The stuffing boxes are deep with ample number of packing rings. The stuffing box glands are of the bolted type with back-off nuts to make repacking simple.

Standard Blackmer units in capacities from 20 to 700 gpm. and pressures up to 300 psi. are available with the new steam-jacketed head. They are furnished with either single or double reduction gear drive and as single or multiple pump units.



KEEPING THE SEA OUT OF HANCOCK COUNTY

The modern dredge "W. J. Gex" is owned and operated by Hancock County, Mississippi, to maintain miles of sloping beaches which protect its sea wall and beautify its water front. The Hancock County Board of Supervisors purchased this equipment for economy and dependability, and they chose a Buckeye Diesel to power the 8 inch dredge pump working against 2,500 feet of suction line. Buckeye Diesels are designed, built, and equipped for just such service and for the excessive demands of war power production.

Direct Drive or Electric Units—75 hp. to 960 hp.
Engine Builders Since 1908

Be Profitwise and Dieselize with Buckeyes
THE BUCKEYE MACHINE COMPANY LIMA, OHIO

Army-Navy "E" Award To Leece-Neville

EXECUTIVES and employees of The Leece-Neville Company, Cleveland, pledged themselves individually and as a group to maintain high standards of quality and volume which won them the Army-Navy Production "E" award October 28. The "E" pennant was presented to President B. M. Leece by Major Merle Armitage, Central Procurement District. Award pins were given to John T. Bishop, oldest employee, and Anna Kumhall, oldest woman employee, representing over 600 women employees, by Lt. J. B. Garfield of the 9th Naval District.

President Leece stated that everyone in the company has a most serious responsibility to build strongly, accurately, and faster for our men throughout the world. Bishop said that the man on the lathe or assembly line "has it pretty soft compared to the men behind the guns. We'll back them up to the limit."

The company, founded in 1909 to make automotive equipment, pioneered in design and application of electric starters and lighting. It

designs and builds electric generators and other electrical equipment for automotive vehicles, aeroplanes and for marine use. It had furnished much equipment to army, navy and air corps for many years before Pearl Harbor. In consequence, production has been multiplied many times and employment has doubled during the past year.

New Post for Earl Wesselhoff of Morse Chain Company

WALTER BERTRAM, Sales Manager of Morse Chain Company, Ithaca, N. Y., announces the appointment of Earl Wesselhoff as manager of the Boston Branch to succeed C. L. Pratt, Jr., who has resigned.

Mr. Wesselhoff goes to the Boston Branch from the Detroit plant where his first association started twenty-two years ago as automotive timing chain drive engineer. Mr. Wesselhoff had much to do with the early development and application of silent automotive timing chain drives. Since he joined Morse he has served in several engineering capacities and was subsequently promoted to the dual position of chief engineer plus the sales directorship of the Morse Indexing and Free-Wheeling Clutch

Lines. He has had a long and extended career in the industrial power transmission field as well as in automotive timing drives.



Earl Wesselhoff

For several years Mr. Wesselhoff has been identified with many engineering improvements in the Morse line of Indexing and Free-Wheeling

REMOTE CONTROL *Sperry's* HYDRAULIC "EXACTOR CONTROL"

assures

the smallest movement being
transmitted over long distances
without backlash

Installation simple, quick, economical



TRANSMITTER

Engine Fuel Injection
Governor Setting
Reverse Gear Oper. Mechanism
Electric Generators, etc.
controlled from a central station
(loads up to 100 in. lbs.)

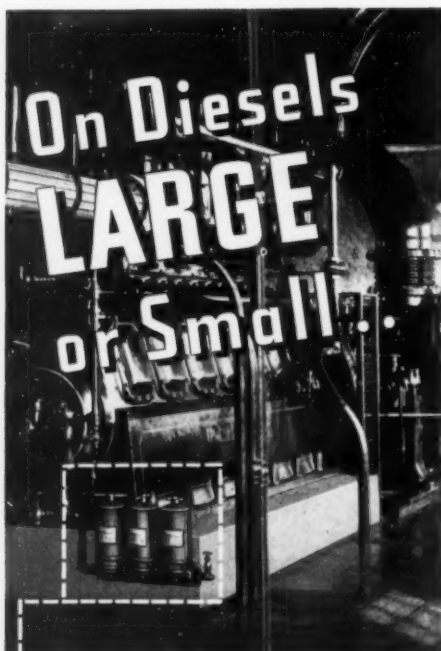
SINGLE TUBE REPLACES:
Cables, Turnbuckles
Pulleys, Bellcranks
Push Rods, etc.



RECEIVER

Sperry Bulletin 78-C Gives Details

SPERRY PRODUCTS, INC. • HOBOKEN, N. J.



DELUXE Guards Against Trouble-making OIL CONTAMINATION

Reduce the risk of Shortened Life of Pistons and Bearings, Poor Engine Performance, Costly Shutdowns. How? With a DeLuxe Filter, which prevents oil contamination.

DeLuxe and DeLuxe alone* does this —by removing the asphaltene from the oil, before they join with other substances to produce engine varnish and sludge.

Further, you can use any Fortified Oil, without danger of altering its chemical balance. DeLuxe's cleansing action is not dependent upon any chemical agent.

These trouble-preventing advantages result from—



*DELUXE'S EXCLUSIVE CONSTRUCTION

Only DeLuxe has all 8 of the construction features illustrated here, which are essential to continuous, complete oil cleansing. Growing knowledge of this fact helps explain why more and more Diesel engines of every type are being equipped with DeLuxe Oil Filters. Get the full story of their unique construction. Write for interesting illustrated bulletin on DeLuxe oil cleansing. DeLuxe Products Corporation, 1416 Lake Street, La Porte, Indiana.

DELUXE OIL FILTER

DOES MORE THAN STRAIN OIL
MORE THAN FILTER OIL

Actually Cleanses Oil!

Clutches. He performed noteworthy engineering in pioneering the development of practical dual-drive hook-ups involving combinations of prime movers such as turbines, electric motors, and engines for driving centrifugal water pumps and forced and induced draft fans, etc. He also achieved success in working out practical principles and applications for utilizing standardized, high speed gas and Diesel engines by efficiently harnessing and automatically controlling them through multiple hook-ups of from one to twelve engines to produce a single source of dependable and economical power.

In the new post, Mr. Wesselhoff, known to his many friends as "Wess," will make his quarters in Boston, from which he will service Morse Chain Company accounts throughout the New England States in a sales, engineering and service capacity.

"AAF In Industry", A New Bulletin On Air Filtration and Dust Control

A NEW, thirty-two page bulletin covering the full range of Air Filtration and Dust Control has been issued by American Air Filter Company, Inc. This comprehensive book covers the chronology of Dust Engineering, tabulation of Size and Characteristics of Air-Borne Solids, chapters on Atmospheric Dust, Process Dust, Filtered Air for Industrial Air Conditioning, Filtered Air for Industrial Ventilation, Control of Bacteria and Mold Spores, Protection of Internal Combustion Engines and Compressors, and many other allied subjects. It also carries a complete list of available literature on air filter equipment for specific air filtering conditions. Write to American Air Filter Company, Inc., Louisville, Kentucky for your free copy of the bulletin, "AAF In Industry."

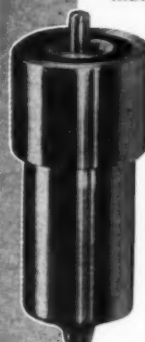
Twin Disc Appoints John B. Jenkins Manager of Hydraulic Division

THE TWIN Disc Clutch Company, Racine, Wisconsin, announces the appointment of Mr. John B. Jenkins as manager of the Hydraulic Division, Rockford, Illinois.

For the last eight years, Mr. Jenkins has been in charge of the company's factory branches at St. Louis, Tulsa and Dallas. The active field experience, which he brings to this position plus his previous experience at the Twin Disc factory in Racine, will assure Twin Disc customers a sympathetic understanding of their problems and the complete co-operation of the Hydraulic Division.

PRECISION BUILT DEMCO FUEL INJECTION EQUIPMENT

Demco design, manufacture and test are based on the ultra-precise requirements of effective Diesel fuel injection. Demco fuel injection units are characterized by compactness and clean, simple design, highest quality materials, superb workmanship.



Demco Fuel Nozzle

Nozzles are made in three sizes, with flat seated needles of standard or non corrosive materials. No. 4 nozzle is self-cooling.



Demco Fuel Injector

Fuel injectors are hydraulically operated, differential, closed type and are made in various lengths with three standard shank diameters.



Demco Fuel Injection Pumps

"PH" fuel injection pumps are port controlled type; they are adaptable to a wide range of Diesels with minor adjustment of timing.

Send specifications
with inquiries

DIESEL ENGINEERING & MANUFACTURING COMPANY

200-214 N. LAFLIN ST., CHICAGO, ILLINOIS

Allis-Chalmers Releases Slide Rule "Motor Finder"

TO help motor users fill their wartime motor needs with the least possible delay, as well as conform to recent WPB recommendations, Allis-Chalmers now offers a new "Motor Finder" for quickly selecting the various types of squirrel-cage motors.

Standard types of the squirrel-cage—the most readily obtainable motor—are actually even more versatile than is commonly realized, this prominent motor manufacturer points out. Because of this, and important



savings in time and materials due to standardization, WPB is urging careful consideration of the squirrel-cage types first.

With the new "Motor Finder" slide-rule, the motor user is able to match the conditions under which the motor must operate at the proposed installation with the required motor characteristics and instantly learn the right motor type and its features.

So handy is the new "Motor Finder," that only three simple steps are necessary to pick a motor. Since over thirty standard types, covering a range in horsepower from $\frac{1}{2}$ to 75, are included in the Allis-Chalmers Lo-Maintenance line, all of the characteristics of versatility of squirrel-cage motors are immediately considered in using the slide-rule. The potential motor buyer thus takes fullest advantage of the most available motors he can buy in wartime.

Copies of the new slide-rule can be obtained free of charge on request from the Allis-Chalmers Mfg. Company, Milwaukee, Wisconsin.

The New NUGENT Re-Placeable "Throw Away" Filter Recharge

WM. W. Nugent & Co., Inc., of 410 N. Hermitage Ave., Chicago, Illinois, manufacturers of a complete line of Filters and Lubricating Specialties, have introduced a new type of inexpensive recharge for their absorbent type fuel and lubricating oil filter. It is inserted in the filter cage instead of hand packing loose waste. When dirty, remove the cage from the filter shell, turn it upside down and the recharge slides out and is "Thrown Away." One man can easily do the job in a few minutes without using any tools.



AMERICA'S AIR-COOLED RADIAL DIESEL ENGINE

POWER THAT HITS HARDER, FASTER, FARTHER—that's Diesel Power! And that is the power that America needs and is getting from the Guiberson Radial Diesel Engine to help the democracies out-punch the Axis. Guiberson Diesels for tank and aircraft use weigh less than 2 pounds per horsepower.

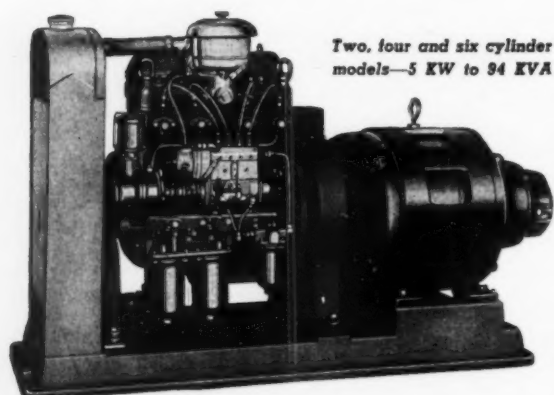
POWER THAT IS SAFE AND DEPENDABLE—that's Diesel Power! More than 10 years ago the first A.T.C. certificate for a Diesel engine for airplane use was issued to Guiberson. The use of Diesel fuel eliminates fire hazard. There is no ignition system to cause sparks or to interfere with radio operation.

POWER THAT COSTS LESS AND GIVES MORE—that's Diesel Power! Giving 50% more power per gallon of fuel (and low cost fuel at that) as equivalent powered gasoline engines, Guiberson operation costs are extremely low. The flat torque curve of the Guiberson keeps maximum power flowing at all operating speeds.





U. S. DEPENDABILITY



Two, four and six cylinder models—5 KW to 94 KVA

U. S. DEPENDABILITY, in peacetime, means user satisfaction, convenience, low cost service. Today **U. S. DEPENDABILITY** means life or death . . . battles won or lost. *Electricity is the nerve center of modern warfare.*

U. S. MOTORS CORP.
OSHKOSH, WISCONSIN

U.S. DIESEL

ELECTRIC PLANTS

The use of this recharge eliminates the laborious, inefficient and expensive task of repacking loose waste in the cage by the operator in the field or at sea. Better filtering is obtained at less cost.



This recharge is manufactured of special absorbent cotton material and will absorb four times its own weight of water, dirt, and other impurities. In a recent test on a locomotive Diesel engine, a size 4L recharge weighing 9¼ lbs., new, absorbed 18¼ lbs. net of semi-dry oily carbon and other impurities. (Moisture and water absorption is greater.) Acidity in lubricating oil is also reduced; as an example—from neutralization number 0.4 to 0.004 in one instance. It will not remove additives that are scientifically embodied in the oils at the refinery.

The absorbent material is scientifically packed and supported in the recharge to produce even and controlled filtering. No channeling or capillating. The outside surface contacted by the dirty, incoming oil is larger than the final inside filtering surface and is effectively graduated between these points. Hence the larger dirt particles are removed, first, by the larger area and the impalpable materials; last, by the denser filtering material.

When writing for details, refer to the Nugent Re-Placeable "Throw Away" Filter Recharge Figure 1280BT.

Metal Clad Switchgear

HORIZONTAL drawout metal clad switchgear in 100,000; 150,000; and 250,000 Kva. capacities at 5000 and 15000 volts is described and illustrated in a new twelve page publication, Catalog 1110, recently released by Roller-Smith Company.

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The advantages of metal-clad switchgear in safety, reliability, and ease of installation and maintenance are pointed out. Construction details on the Roller-Smith design are described and illustrated. Complete dimensional data on the various types of gear available are also included. Copies of Catalog 1110 can be obtained without charge from Roller-Smith Company, Bethlehem, Pa.

Little Girls Drive Big Mack Buses

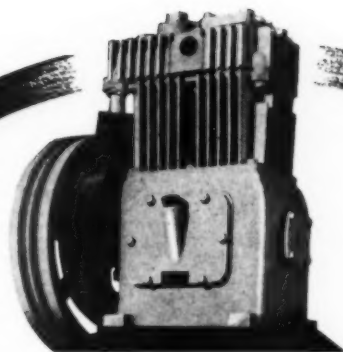
THE FIRST women bus drivers in America are now on the job. They're driving big 44-passenger Mack-Diesels through the congested streets of San Diego, California, where an influx of war workers and Navy personnel has boosted transit riding more than 208% over last year.



The invasion of this hitherto masculine occupation came about with the recent hiring of fifteen girl drivers by the San Diego Electric Ry. Co. The girls are not being pampered either: they've been assigned to the busy line that serves the big aircraft factories and the various Naval stations. The buses used on this route, big 44-passenger Diesel Electric Macks, weigh 32,000 pounds when fully loaded and have an overall length of 35 feet. According to an observer, "It is really marvelous to see the ease with which these girls handle the big Macks. They move away from the curb without a jolt, turn the corners without any trouble at all, and ease the buses through holes in traffic with perfect timing and precision."

"Needless to say," he continues, "the girls are very popular with the workers and service men. They have a strong psychological effect on the customers with their smiles and courteous way of taking fares and giving directions."

Whether San Diego's innovation is the beginning of a war-time trend remains to be seen. In any event, the success of these girls on this most exacting job would seem to indicate that, in America's War Effort, no task is too tough for members of the "gentle sex."

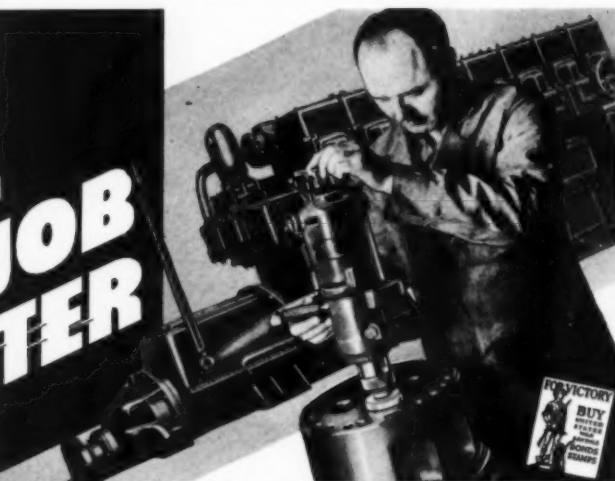
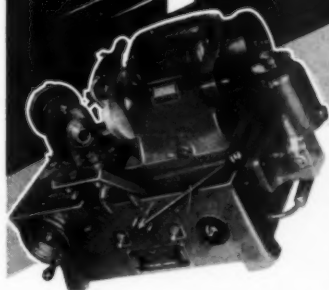


1st in design TOPS IN EFFICIENCY

QUINCY was first to design an air compressor that combined modern appearance with improved mechanical features. Construction is simpler. Radiation area is increased 12%. Lubrication is more thorough—more positive. Quincy builds air compressors exclusively. This policy of specialization has made the name "Quincy" a symbol for dependability. Quincy Compressors provide air for Diesel starting and other services requiring intermittent pressures up to 500 lbs. per sq. inch. *If you have compressed air problems in your work, let us help you solve them!* QUINCY COMPRESSOR CO., Dept. 4122, Quincy, Ill.

Quincy
COMPRESSORS

**HOW TO DO
A BETTER
DIESEL JOB
FASTER**



Just get a HALL Diesel Type ECCENTRIC Valve Seat Grinder and use it as pictured at right . . . then reface the valves to the same fine finish and precision with the HALL Wet Type Diesel Valve Refacer. That's all there is to doing a better valve job faster and more economically.

The result will be better engine performance longer, with maximum fuel economy. The job will be out of service for less time and less frequently.

Write today for complete information.

THE HALL MANUFACTURING CO.
TOLEDO, OHIO

HALL **DIESEL VALVE SERVICING EQUIPMENT**

Highest Quality Gaskets & Oil Seals

by **FITZGERALD**

Gasket Craftsmen
for 36 Years

Gaskets of all types and materials to
give reliable service under all Diesel
operating conditions.

For full information write ~

**THE FITZGERALD MANUFACTURING
COMPANY**

TORRINGTON, CONN.

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SINCE 1906
GASKETS
THE COMPLETE LINE THAT COMPLETELY SATISFIES



Today, these famous WITTE Dieselectric Plants
are aiding the war effort by supplying de-
pendable low cost auxiliary power for indus-
try everywhere. Right now, America's vic-
tory needs come first. **PROMPT SHIPMENT
GIVEN TO HIGH PRIORITY ORDERS.** After
victory, improved WITTE Dieselectric Plants
will again be ready to serve everyone.

A WITTE Diesel is worth waiting for . . .

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WITTE ENGINE WORKS
LARGEST BUILDER OF SMALL DIESELS

SPRING-MOUNTINGS
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NOISE-SILENCING-HOODS
for REDUCING MACHINERY-NOISES

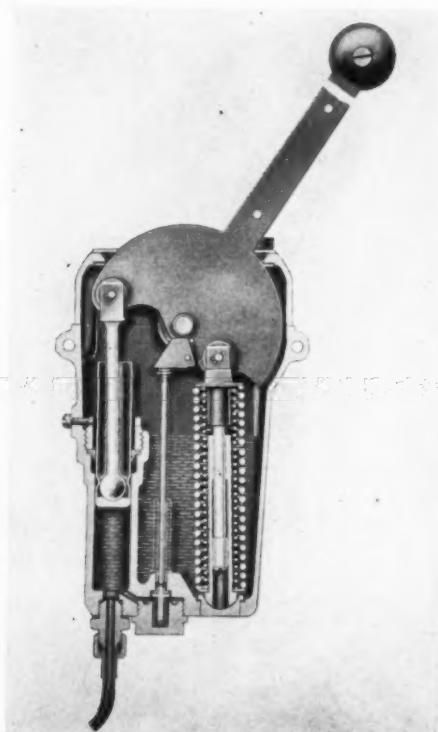
**SHOCK-ABSORBER-
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for SHOCK-ABSORPTION AND
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Sperry Exactor Hydraulic Control Improved

THE Sperry Exactor Hydraulic Control, hav-
ing wide application to Diesel engine regula-
tion in marine, railway, and industrial fields,
has been refined in design to incorporate a
number of noteworthy features. The control
in its present state of design embodies im-
provements over early types which broaden its
fields of application and simplify its construc-
tion and operation.



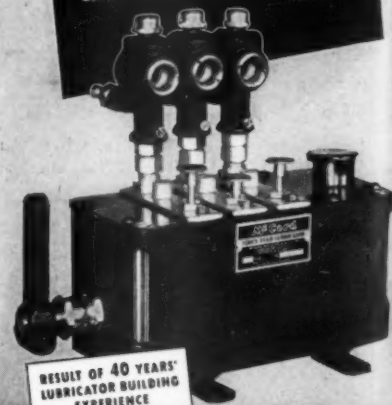
In the type E Control, illustrated above, the
initial small reservoir, formerly located inside
the transmitter, has been eliminated to increase
the oil capacity and save weight. The oil filling
passage has been located on top of the trans-
mitter and a top seal has been added to permit
using the unit in an upside down position for a
limited time. The stroke arc has been increased
from 50 to 55 degrees. Several other advan-
tageous changes have been made including pro-
vision for multi-station control which permits
operation of a single receiver unit from a num-
ber of different stations. Among the new ac-
cessories added to the control are a latching
device, table mounting type transmitter, brake
and special receiver units designed to perform
unusual functions. For full particulars write
Sperry Products, Inc., Hoboken, New Jersey.

Chicago Pneumatic Appoints Plant Coordinator

APPOINTMENT of E. P. Barry, as Coordi-
nator of Plants for the Chicago Pneumatic
Tool Company, was recently announced by

McCORD
Class S.F.
LUBRICATORS

A modern lubricator for modern service
on Diesel, gas, steam engines and com-
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lubrication in metered quantities reducing
friction and wear. Capacities: 2 to 24 pt.
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DIESEL ENGINES

Total 1600 HP. required, with or without Generators.
Consider units 225 HP. and larger. Also smaller high
speed units for standby service. Preference given units
immediately available. Give complete details and price.

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Box 130, Diesel Progress, 2 W. 45th St., New York

YM LUBE OIL PURIFIERS
REMOVE FUEL DILUTION
ACIDS . . . SLUDGES . .

Clean Oil . . . Clean Engines

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PETROMETER CORPORATION
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**FUEL INJECTION
EQUIPMENT**
for Installation by
DIESEL ENGINE BUILDERS

EX-CELL-O CORPORATION

Diesel
Division

Detroit
Michigan

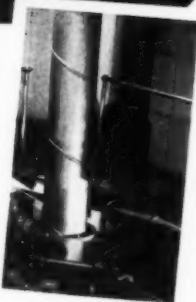
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EX-CELL-O MEANS PRECISION

No Other Exhaust
and Intake Pipe
Give You These

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IT ABSORBS
VIBRATION
IT'S EASY and QUICK
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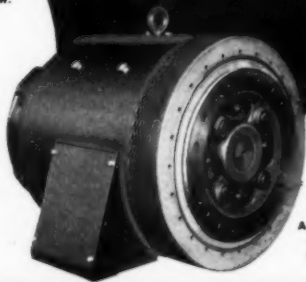


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Users and builders of smaller Diesel Engines find Burke Direct or Belt Drive Generators the answer to auxiliary and stand-by units for emergency lighting or power.

Write Burke for recommendations. You profit by Burke's 50 years' experience.

A. C. or D. C.
Generators to
1000 K.W.



A. C. or D. C.
Motors to
1000 H.P.

BURKE ELECTRIC CO Erie, Pa.

H. E. Jackson, President, at the Company's Head Office, 6 East 44th Street, New York.

Mr. Barry, formerly of Glenn L. Martin Co. aircraft manufacturers at Baltimore, Md., will supervise machine equipment, tool designing, and production methods for the four plants of the Company located at Detroit, Cleveland, Franklin, Pa. and Garfield, N. J.

With over twenty-five years of experience in machine tool designing and production, Mr. Barry is well suited for the newly created position at Chicago Pneumatic. After serving four years apprenticeship as a tool and die maker and gaining practical experience with various concerns, he joined the Glenn L. Martin Company in 1922, where he remained until recently. During his twenty years in airplane manufacturing, he fulfilled many key positions—and was serving in the capacity of Plant and Equipment Engineer at the time of his resignation.

Mr. Barry is well known in many industries. In the yacht building field, he supervised the construction of the mast and rigging fittings for several Cup Defenders including the *Enterprise* and the *Rainbow*.

Tocco Process Surface Hardens Metal Parts of Intricate Design at Rapid Rate

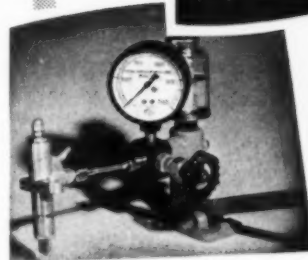
THE Tocco process of induction hardening, which has speeded up many industrial processes, can surface harden machine parts at a very rapid rate even though the area to be hardened is of very intricate design. This is



Tocco Jr. Hardening Machine

being demonstrated by hardening shafts for the rocker arms of automotive engines, according to metallurgists in the Tocco division of the Ohio Crankshaft Company of Cleveland, where the process was developed.

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FOR DIESEL ENGINES

STOP THAT SMOKE! Test your diesel nozzles quickly, accurately — with America's most widely used nozzle tester. This sturdy, light-weight, precision-built, low-cost, portable hand test pump can help you avoid costly delays and possible damage to injector tips.



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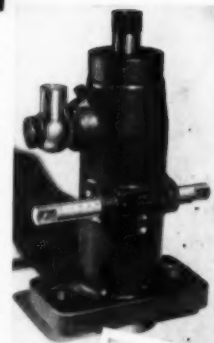
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Manufacturers of Diesel Pumps, Injectors, Nozzles, Nozzle Holders, etc.

Adeco FUEL INJECTION EQUIPMENT

for Greater
POWER
DEPENDABILITY
ECONOMY

Adeco Single Unit Fuel Injection Pumps, Nozzles and Nozzle Holders are meeting highest requirements for power, dependability and economy. Port control Model "P-22-30", at right, which is currently in production, is available in plunger diameters from 16mm. to 22 mm. Adeco precision-built Nozzles and Nozzle Holders are engineered for reliability and cover a complete range of applications. Size No. 4 Nozzle Holder and Nozzle, at right, currently in production, now available in standard lengths.



Write for descriptive bulletins

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Manufacturers of Diesel Pumps, Injectors, Nozzles, Nozzle Holders, etc.



SIMS Heat Exchangers for lube oil and jacket water cooling are ruggedly and efficiently built.

They are designed to give adequate cooling protection even under abnormal conditions.

Sims engineering is backed by years of experience with heat exchange problems.

WE ARE STILL IN POSITION TO ACCEPT PRIORITY ORDERS

Address inquiries to:

THE SIMS COMPANY
ERIE, PA.

METERING
WILL STOP LOSSES,
CUT COSTS,
IMPROVE EFFICIENCY
IN YOUR PLANT—

There is only one accurate way to measure the oil consumed by Diesel engines—by meter.

Diesel power requires accurate meter records to prove its economy.

In addition, the careful daily analysis of meter readings will show up power loss at its inception and guard against overloads.

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PITTSBURGH, PENNA.



Pittsburgh Piston Meter for Measuring Oil Used by Diesel Engines.

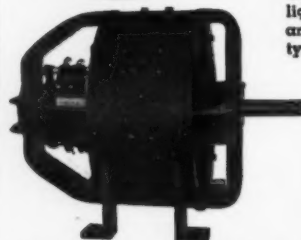
COLUMBIA

A. C. AND D. C. GENERATORS

Columbia A.C. and D.C. Generators are designed and widely used for light and power service and are ideal for use as ship auxiliaries. They are light in weight, compact and can be furnished in single bearing type for direct connection to engines.

A.C. Generator sizes range from 6 1/4 to 300 KVA. Speeds: 1800, 1200, 900, 720, 600, 514 and 450 R.P.M. Single or three phase; direct connected or belted exciters.

Columbia D.C. Generators range in size from 7 1/2 to 200 KW, 36, 60, 125 and 250 volts and in speeds of 1750, 1450, 1150 and 850 R.P.M.



COLUMBIA ELECTRIC MFG. COMPANY
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Rocker arm shafts travel through the hardening machines at such rapid rates that 600 to 6,000 surface areas are hardened in one hour. The machines are virtually automatic. Practically all the operator has to do is to place the shafts in a fixture which guides them down into an electric inductor. These fixtures may be either perpendicular or set at an angle. When a shaft arrives at the proper position, high frequency electric current which raises the temperature on the surface to be heated, is automatically turned on. After a calculated interval, which is only of a few seconds duration, the current is shut off again automatically and the heated area quenched in a water spray.

The machines have indexing mechanisms which permit the shafts to travel down through the fixtures and stop at regular intervals. The areas hardened are so well defined and the temperature so confined to those areas that the remainder of the shaft is not heated. Distortion, therefore, is kept to an absolute minimum. This does away with the necessity for straightening after heat treatment. Hardening of rocker arm shafts is one of the many developments of this process, which was perfected a decade ago for the hardening of bearing surfaces of automotive crankshafts.

Not only can the Tocco machine for hardening surfaces of rocker arm shafts operate continuously for long intervals without readjustment, but it can be set up and placed in operation in a very short time.

"Induction hardening equipment permits surface hardening of only the requisite portion of almost any steel object and thus maintains the original ductility and strength," commented Dr. H. B. Osborn, Jr., research development engineer of the Tocco division of the company. "It permits the user to harden articles of intricate design, which cannot be feasibly treated in any other way. It eliminates expen-

sive pretreatment such as copper plating and carburizing and subsequent straightening and cleaning operations. It also permits a reduction in the cost of materials by affording a wide selection of steels from which to choose and in many instances the hardening of a fully machined part without the necessity of any finishing operation."

Westinghouse Plants Receive Army-Navy Pennants

REAR Admiral William Carleton Watts of the United States Navy recently presented Army-Navy "E" pennants to five Pittsburgh-area plants of the Westinghouse Electric and Manufacturing Company "for high achievement in the production of war equipment." Selected to receive the awards were the Transformer Division at Sharon, Pa., and the East Pittsburgh Division, which includes the porcelain plant at Derry, Pa., Nuttall Gearing Works in Pittsburgh's Lawrenceville section, and plant at East Pittsburgh and Trafford, Pa.

The blue and red Army-Navy flag awarded the East Pittsburgh Division now flies above the



The Modern "Oil Conditioner"

Added to Diesel Fuel Oil

Chemically purifies— aids combustion— gives more power and smoother operation— preserves equipment— conserves fuel oil.

Literature and list of users on request.

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1451 Broadway New York City

Saves Up To 1/3 SPACE!

—and that's only one saving of this remarkable Coupling! IT CORRECTS MISALIGNMENT. No lubrication required.

L-R TYPE "WF"

L-R FLEXIBLE COUPLINGS

FOR DIESELS: Bolts Directly to Fly-wheel, Clutch, or Drum without special drilling. New set of cushions always in Coupling. No shutdown for changing. Ruggedly built, especially for Diesel service. 1 1/2" to 16 3/4" bore. 1.5 to 2500 H.P. at 100 R.P.M.

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make it EASY for anyone to select just the right L-R Coupling for ANY job. Write! LOVEJOY FLEXIBLE COUPLING CO. 4930 West Lake St. ... Chicago, Ill.





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WITH
ROPER ROTARY PUMPS

1—SAVE 50% TIME

Saving installation time is most important in plants producing for Victory — one customer writes: "So far the new ROPER has proved the easiest of all to install. In fact the last 6 ROPERS installed saved 18 hours labor—about 3 hours on each."

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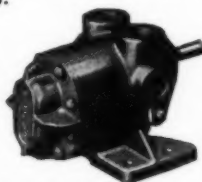
Today with increased production so vital, plants welcome opportunities to get efficient equipment that saves space. Roper "direct drive" pumps require only 48% as much floor space as other models.

3—SAVE 20% POWER

Here is another saving important to the Victory program — Roper "hydraulically balanced" Pumps reduce power consumption as much as 20%.

Send for free Catalog
with valuable pumping
information.

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ROCKFORD, ILLINOIS

ROPER Rotary pumps

CHECK
YOUR FUEL
SUPPLY
AT A
GLANCE



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Diesel Installations

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FUEL INJECTION EQUIPMENT**

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ALARM SYSTEMS
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FOR DIESEL ENGINES**
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Stamford, Connecticut

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Diesels equipped with
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5,400 CFM; 3.5 lbs.
pressure; chain drive.

On land and sea, Roots-Connersville Supercharging and Scavenging Blowers are effective and economical aids in achieving highest Diesel engine horsepower output.

Let the specialized experience of our engineers help you in applying supercharging or scavenging to YOUR Diesels. As war demands are lengthening delivery dates on all vital equipment, inquire now for future needs.

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SINCE 1854

Put Your
Scrap
Into the
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**Supercharging
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BLOWERS**

**CRACKED HEADS WELDED
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OUR 80TH YEAR
PICKERING GOVERNOR CO.
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GASKETS for DIESELS

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STEELBESTOS • TWIN-TYPE STEELBESTOS • KORKOID
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SECRET OF TUTHILL PUMP DEPENDABILITY

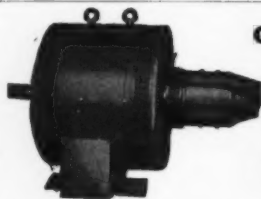
The inside story of Tuthill dependability can be summed up in two words: **PRECISION MANUFACTURE**. Hundreds of thousands of Tuthill Pumps in service prove that it takes skill, experience and production efficiency to create equipment so outstanding and dependable in performance.

Today, more than ever, you need these precision ingredients. That's why it will pay you to specify Tuthill positive displacement, internal-gear rotary pumps.

COOLANT PUMPS . . .
... Capacities to 50 g.p.m.
LUBRICATING PUMPS . . .
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HYDRAULIC PUMPS . . .
... Pressures to 400 p.s.i.
LIQUID TRANSFER PUMPS . . .
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FUEL OIL PUMPS . . .
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Tuthill PUMP COMPANY
939 EAST 95TH STREET • Chicago

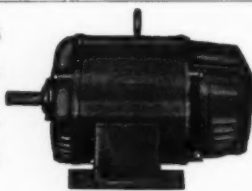


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AC and DC
3 to 150 kw.
For Diesel and
gasoline en-
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AC and DC
¼ to 200 hp.
For all appli-
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tionary and
Marine



STAR generators and motors are extensively used in both stationary and marine service. STAR gear motors are made in both planetary and worm gear types with and without integral brakes.

STAR ELECTRIC MOTOR CO. BLOOMFIELD, NEW JERSEY



They're Tough and Dependable
THAT'S WHY BOAT OWNERS LIKE
"Caterpillar"

MARINE DIESEL ENGINES

This D13000 Diesel Marine Engine uses only 4 gals. of low-priced fuel oil per hr.—yet it handles as many as 25 loaded cars on a float weighing 1600 tons in transfer work from slip to slip.

For Dependable Service
on all "Caterpillar" Engines and
Electric Sets see—

H. O. PENN MACHINERY CO. INC.

New York City

Owners—Spearin, Preston & Burrows, New York.

giant East Pittsburgh works. Covering almost eighty acres, this plant is now turning out equipment at a rate 60 per cent ahead of 1941



Workers in the huge yard at the East Pittsburgh works witnessing the Army-Navy "E" award to Westinghouse Elec. & Mfg. Co.

—producing generators to create electricity for war plants, motors to drive machinery, and control and switchboard apparatus to regulate electric power.

Admiral Watts inspected the Nuttall plant and addressed the workers who make gears for Naval vessels. Later he presented the production award to the Transformer Division at

Sharon, Pa., which manufactures transformers required to step up or step down voltages in the transmission of electric power. Accompanying Admiral Watts and the military party and serving as master of ceremonies was Milton Cross, widely known announcer for the National Broadcasting Company.

At East Pittsburgh, employe representatives included C. H. Smith, Miss Margaret Voburn, Frank C. Russell, Miss Emma Ader, Mr. Metcalfe and Mr. Bollens. Captain F. L. Oliver, United States Navy, retired, presented the pins. At Nuttall, Lieut. Commander Egeler presented pins to Dan McKinnon, Frank Wildman and Miss Catherine Burke, who have served a total of 111 years with Westinghouse. These 50-year veterans—Henry C. Bert, James T. Burke and James R. Stevens—received Army-Navy pins at the Sharon ceremonies as representatives of employes. The presentation was made by Lieut. Cmdr. Roy W. Lewis, Navy, retired.



The Color Guards "present arms" as the Army-Navy "E" is raised above the Westinghouse-Nuttall gear works in Pittsburgh.

The official hosts were W. F. Bailey, manager at the Derry Works, and G. S. Ryan, manager of the Feeder Division, in behalf of the Trafford works and its employes. A. C. Streamer, vice president, accepted the pennant at the East Pittsburgh plant. L. R. Botsai, manager of the Gearing Department, was the official host at the Nuttall plant. H. V. Putman, manager of the Transformer Division, expressed appreciation on behalf of the Sharon plant and workers. A. W. Robertson, chairman of the board, George H. Bucher, president of Westinghouse, and many other top ranking executives attended the various award ceremonies.



Ask the MAN
who Knows
he can
Depend on..

Double Seal Rings

Ask the man down in the engine room whose hands are greasy from tending the machinery what he thinks about Double Seal Piston Rings. "You can't beat 'em," or something to that effect is his usual answer. Men responsible for maintaining uninterrupted economical service from marine and stationery Diesel engines have learned that Double Seal Rings are the surest preventative and cure for costly engine ailments and wasted fuel.

Double Seal Rings exhibit outstanding performance because of the extra quality expertly built into them. Piston rings are not a sideline

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Though we, like hundreds of other loyal American industries, are now busy with defense orders, we are working day and night so that we may continue serving you promptly and efficiently. There is no time for "time out" now! Send us your order for dependable Double Seal Rings.



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Representatives in all Key Cities of United States, Canada and Mexico

INDUSTRY IS ON AN EIGHT-DAY WEEK



Seven days a week America is doing one of the greatest jobs of production the world has ever known. We are living with one part of that job here at Alcoa, where over seventy thousand men and women are producing Aluminum in quantities that were mere fantasy yesterday.

But there's an eighth day tucked in among the few open spaces in the seven-day week. Engineers are able to squeeze in some important Imagineering about postwar products—planning that will help convert war jobs into peace jobs.

For instance:

Imagine what 1,000 pounds less weight in the automobile of the future would mean in performance, gas economy and tire life. Then engineer it down to the realization that 1,000

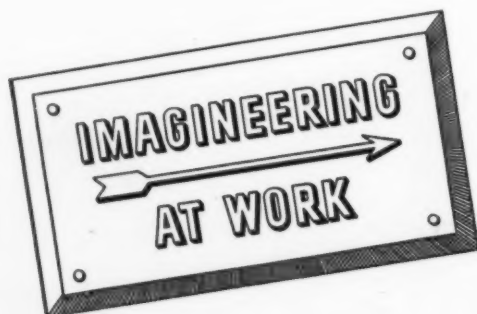


pounds *can* be taken off by using, say, 500 pounds of Aluminum per car.

Now translate possibilities such as these into your own business.

Aluminum costs less today. New methods, techniques, processes, and new forms of metal coming out of the war effort will all be available for the as-yet-untold possibilities in tomorrow's peacetime products and peacetime services.

Our eighth day is devoted to helping Imagineers throughout industry use the potentialities of Alcoa Aluminum in bettering the new ideas they are dreaming up. ALUMINUM COMPANY OF AMERICA, 2141 Gulf Building, Pittsburgh, Pa.



ALCOA ALUMINUM



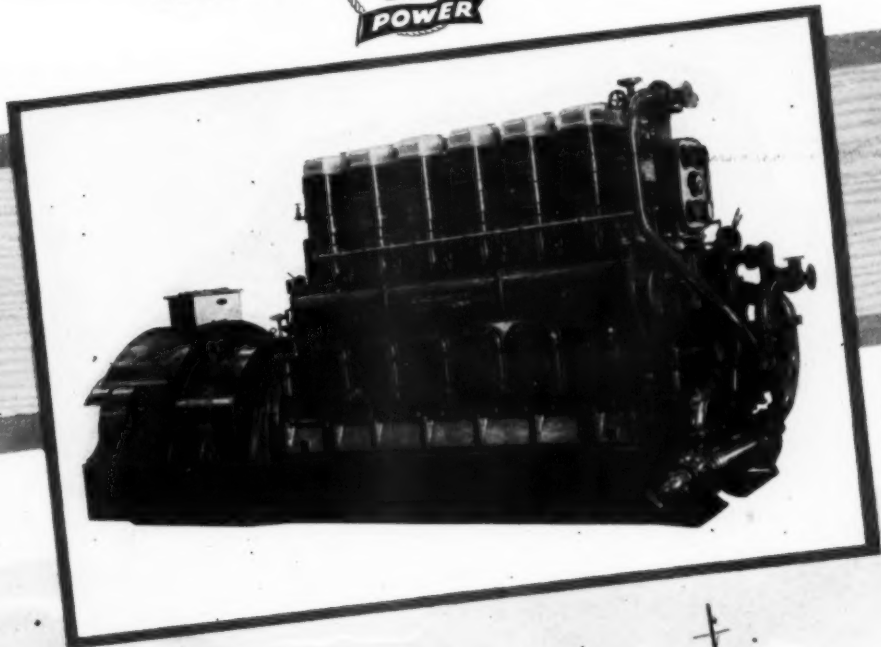
WHERE WEIGHT AND SPACE FACTORS COUNT

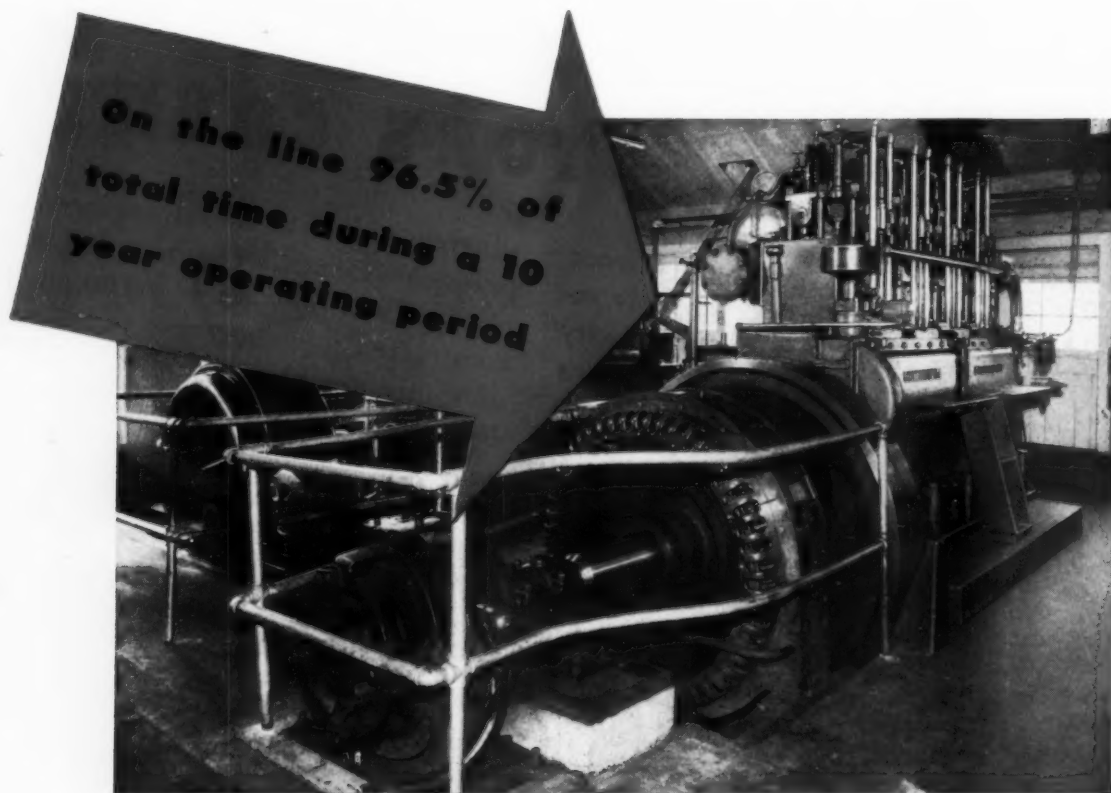
Enterprise quarter-century experience as master engine builders is ably reflected in the modern design-simplicity of powerful engines installed in ships for the Army, Navy and Maritime Commission. Basically, Enterprise Diesel Engines are precision-built to save weight and space displacements—the vital factors in operating economy. Accomplishment is attained by strict

adherence to a threefold engineering practice—One: *Compactness* and simplicity. Two: *Lightweight*, yet ruggedly constructed to stand stress and shocks of unpredictable conditions. Three: *Powerful*, to render unfailing service and quick maneuverability for either direct or electric drive. Our *new* Marine Diesel Catalog Number 172 is ready for your request.

ENTERPRISE ENGINE & FOUNDRY CO.
SAN FRANCISCO
SEATTLE

WASHINGTON, D. C.
NEW YORK





This remarkable record was achieved by the Worthington 300-hp. 4-cycle diesel engine shown above . . . forerunner of Worthington's present line of totally enclosed units.

Operating Time	78,487 hrs.
Load Factor	50%
Kilowatt Hours Produced	8,511,660
Cost of Repairs per KW. hr.	8/100 mills
Total Cost per KW. hr.702 cents
(Including fuel oil, lubricating oil, labor, repairs and supplies)	

Such a record speaks for itself, and it is typical of the performance of the hundreds of Worthington diesel and gas engines that are carrying important parts of the United Nations' war power load.

DIESEL ENGINES

150 to 1500 hp.

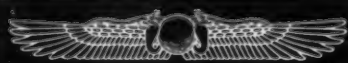
GAS ENGINES

175 to 2880 hp.

CONVERTIBLE GAS-DIESEL ENGINES

150 to 1500 hp.

DE2-4



WORTHINGTON

WORTHINGTON PUMP & MACHINERY CORPORATION • GENERAL OFFICES: HARRISON, N. J.



SEALED POWER

and the explosions behind...

Behind the explosions of bombs or shells or cartridges are the explosions in the engines that take men and guns to the battle field.

And wherever you find gas or diesel engines in this war you are almost sure to find Sealed Power Piston Rings, Pistons or Cylinder Sleeves. Service to engine manufacturers and to motorists in times of peace won for Sealed Power engine parts a place in the specifications for tanks and army trucks and jeeps, bombers and

fighters and pursuit and cargo planes, submarines and torpedo boats and destroyers.

Engine manufacturers, car and truck manufacturers, plane builders, boat builders, Army and Navy officers constantly consult with Sealed Power Engineers on their engine problems.



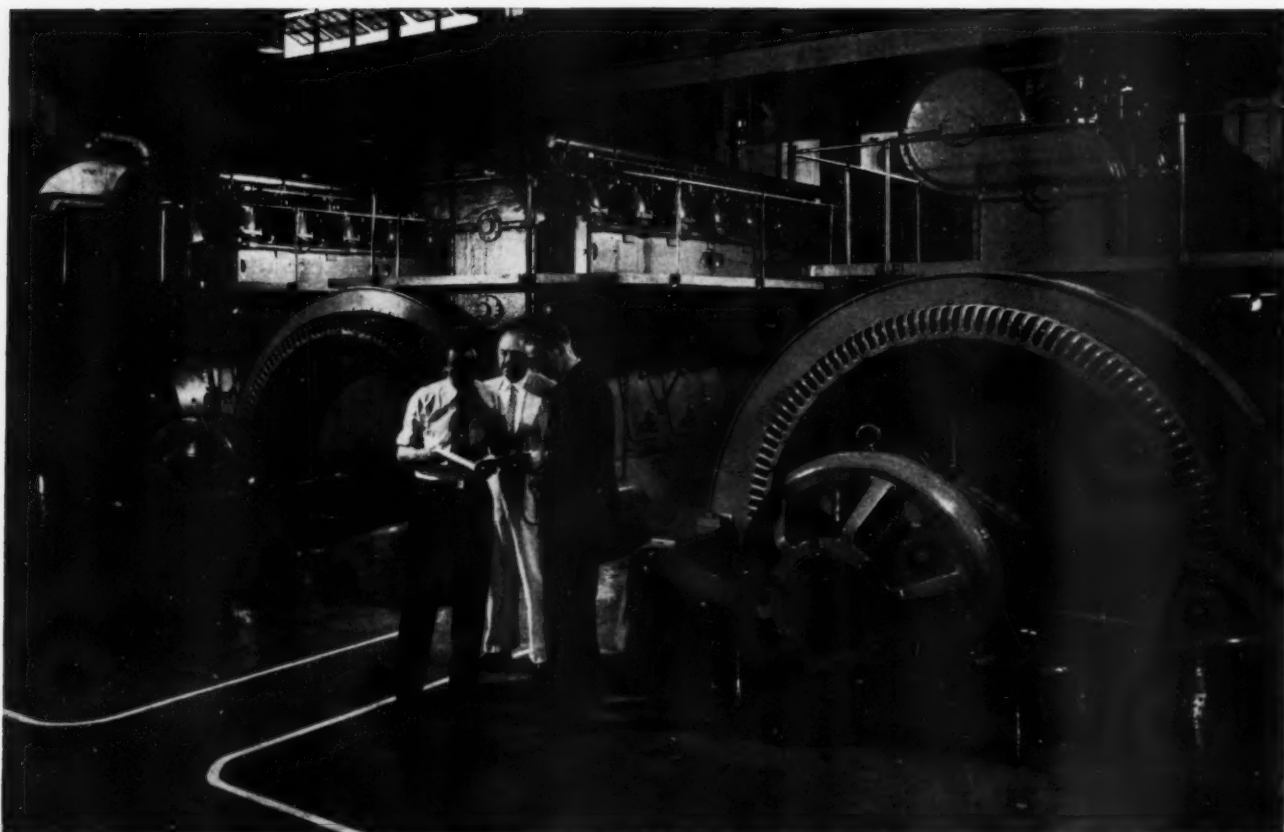
SEALED POWER CORPORATION

MUSKEGON, MICHIGAN

WINDSOR, ONT., CANADA

BUY MORE WAR BONDS

PISTON RINGS — PISTONS — CYLINDER SLEEVES



After 12,000 hours operation with Gulf Quality Diesel Lubricating Oil:

- ✓ Negligible bearing and cylinder wear.
- ✓ Rings, pistons and valves in almost perfect condition.

ANOTHER example of better lubrication with Gulf Diesel lubricating oil! A recent check-up of these three Gulf lubricated 1000 hp. Winton Diesels after 12,000 operating hours showed: (1) Negligible bearing and cylinder wear, (2) Rings, pistons and valves in almost perfect condition. And during this 12,000 hour period, no repairs of any kind were necessary to lubricated parts.

You are sure of better lubrication for your Diesels when you put the proper Gulf lubricating oil in service. For Gulf Diesel lubricating oils not only possess higher lubricating value, but they stand up better under the peak load operating conditions of today—conditions which often cause excessive wear, high maintenance expense and below standard Diesel performance.

For higher operating economy in your plant, take this step today:

Call in a Gulf Industrial Lubrication Service Engineer and ask him to recommend the proper type and grade of Gulf Diesel lubricating oil to fit your particular requirements. His thorough training and broad experience with all types of Diesel engines is your assurance of sound recommendations.

Gulf higher quality lubricating oils are quickly available to you through more than 1200 warehouses located in 30 states from Maine to New Mexico. Write or 'phone your nearest Gulf office today.



GULF OIL CORPORATION
GULF REFINING COMPANY
GULF BUILDING • PITTSBURGH, PA.

For a tough job

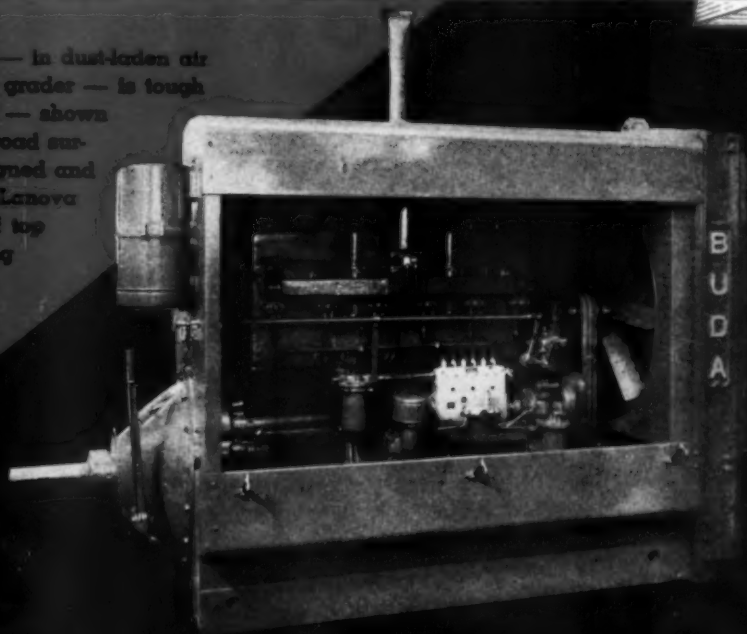
use



BUDA-LANOVA Diesels

Operating in the open — in all kinds of weather — in dust-laden air at 7500 ft. altitude — driving a rock crusher and grader — is tough on power units. The two Buda-Lanova Diesels — shown above — are getting out 100 to 200 tons a day for road surfacing in Crater Lake Park, Oregon—they are designed and built for just such tough assignments. Every Buda-Lanova Diesel Power unit combines the Lanova principle of top output at low operating pressures with Buda's long engine building experience — a combination tough to beat.

Illustrated right: Buda-Lanova 6-DH-309 Diesel power unit with radiator cooling, fuel, lube, and air filters, and clutch—a complete portable Diesel power unit ready to run anywhere.



THE BUDA CO.

HARVEY

ESTABLISHED 1881

CHICAGO
SUBURB

ILLINOIS

MILLIONS OF FEET OF AIR *Cleaned* AND *Quieted* DOWN



**Quick facts about
AIR-MAZE oil bath
Filter-Silencers**

1. 99.83% continuous protection against dust and dirt.
2. Less than $1\frac{1}{2}$ " H₂O pressure drop.
3. Constantly cleaned by automatic oil-washing action.
4. Highly efficient acoustical chamber.
5. Made in a wide range of sizes and capacities.

AIR-MAZE Oil Bath Filter-Silencers

reduce excessive noise . . . eliminate abrasive grit

When a large Eastern company decided to install this huge compressor in the power plant of their foundry, they faced the two way problem of:

1. Protection of compressor against unusual dust conditions.
2. Protection of workmen from objectionable intake noises.

As shown above, Air-Maze Oil Bath

type Filter-Silencers provided the satisfactory answer. Automatic oil-washing action now handles the heavy dust load. The highly efficient acoustical silencer unit reduces intake noise to a minimum.

Have you a problem that involves the cleaning and quieting of intake air? It pays to ask the AIR-MAZE engineers first.

AIR-MAZE CORPORATION • General Offices, CLEVELAND, OHIO



PROOF

THAT BRIGGS CELLULOSE FILTERS OIL *PROPERLY

***WITHOUT AFFECTING OIL ADDITIVES**



ON CRUISERS



ON SUBMARINES



ON P.C. BOATS



ON MINESWEEPERS

Four months ago Briggs new cellulose was placed on the market as a filtering medium for the new detergent oils.

Since then, thousands of hours of rigorous service have proved the cellulose to be ideally adapted to the special purpose of filtering detergent oils.

Based on its proved performance, an ever-increasing number of cellulose type clarifiers are being used on diesel engines of all makes, sizes and types, on our many machines of war.

The cellulose is extremely long fibered, porous and waterproof, developed in the laboratories of Briggs Clarifier Company after years of intensive research. Briggs engineers feel it is the finest available material for filtering detergent oils. It does not remove any known additives.

- 1-Cotton sock protects inside layer and ends of the cellulose.
- 2-Outside wire screen protects the refill.
- 3-Cellulose is wrapped around center tube.
- 4-Perforated metal center tube evenly distributes oil flow.
- 5-Strong spring strengthens core.



Cutaway view of a typical cellulose refill is shown

BRIGGS

Clarifier CO.

1339 WISCONSIN AVE.

WASHINGTON, D. C.

SPEED VICTORY BY BUYING WAR BONDS AND STAMPS



Don't Let Your Bearing System Become "Plugged"

CORRECT DIESEL LUBRICATING OIL KEEPS OIL PASSAGES CLEAR

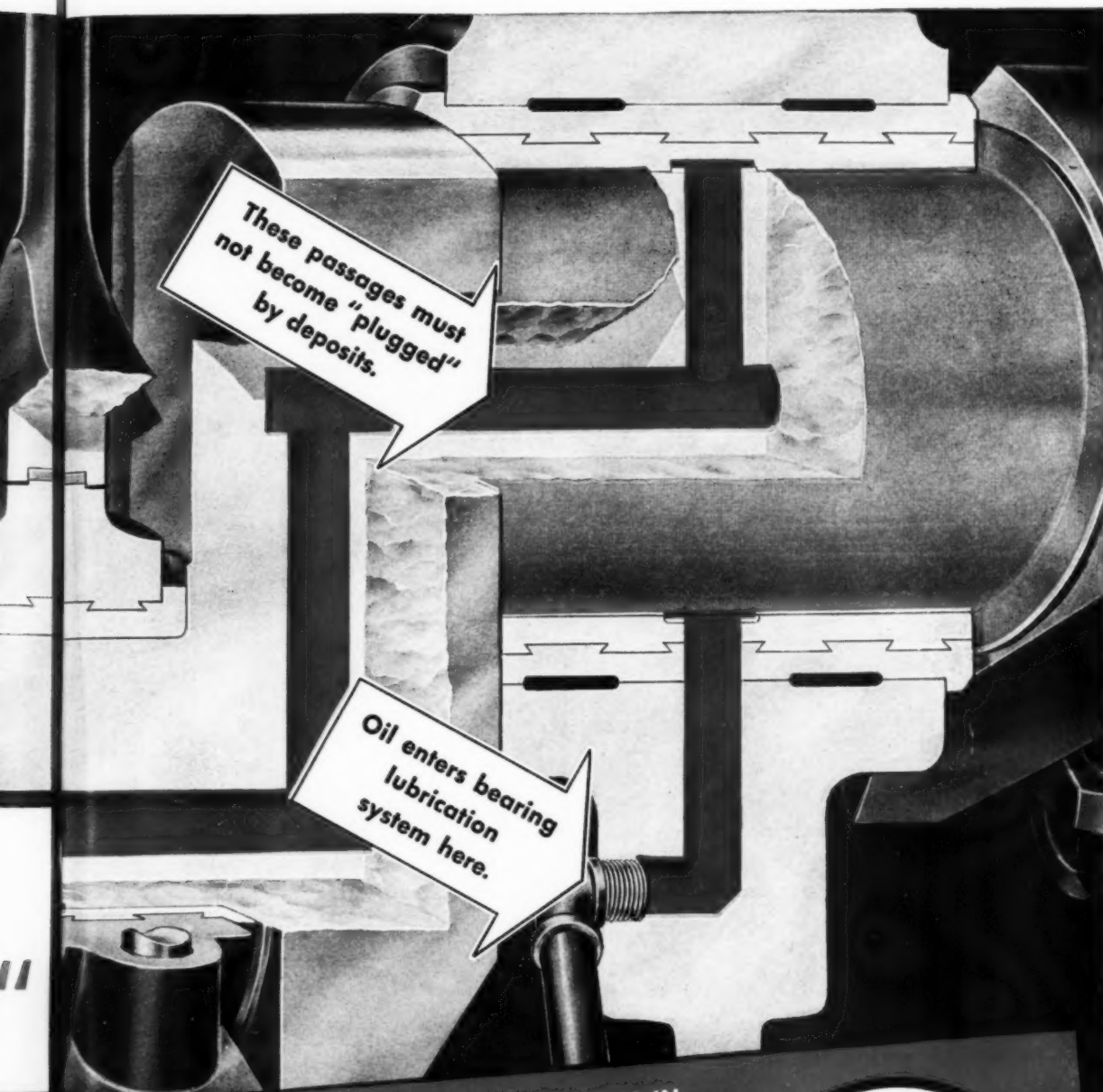
Problem: A pump forces oil under pressure through a header from which branches lead it to the main bearings. From the main bearings, it flows through holes drilled in the crankshaft and in the connecting rods to the crankpin and pistonpin bearings.

Heat and oxygen are the chief enemies of efficient bearing lubrication. Unless an oil strongly resists oxidation, sludge may form and deposits settle in the oil passages—"plug them"—and "starve"

the bearing. This can result in costly repairs and time out for bearing replacements.

Answer: Gargoyle D.T.E. Oils 1-to-5 are specially made to stand up under the attack of heat and oxygen in large and intermediate size Diesels, thus resisting the formation of deposits.

Delvac Oils assure the same reliable service in small high-speed Diesels for which they were made.



TO HELP MAINTAIN WARTIME PRODUCTION, CALL IN

SOCONY-VACUUM for "Correct Lubrication"

SOCONY-VACUUM OIL CO., INC. — Standard Oil of N. Y. Div. — White Star Div.
Lubrite Div. — Chicago Div. — White Eagle Div. — Wadhams Div. — Southeastern Div.
(Baltimore) — Magnolia Petroleum Company — General Petroleum Corporation of Calif.





America's School Kids Have Set Us an Example

The youngsters of America are taking the drive for scrap metal seriously. In school yards you can see mountains of metal—old bird cages, lawnmowers, velocipedes, roller skates, rusty shovels, toy guns, lead soldiers and what-have-you.

Our country needs scrap as never before. All of us in the metal-working industries

can help. All we have to do is select a central and accessible spot in the plant and say, "That's the scrap heap—pile it up!"

Why not take a good look at inventories and see how much obsolete stock is available, which could do more good on the scrap pile than in the storeroom?

**BUSCH-
SULZER**
ST. LOUIS

America's Oldest Builder of **DIESEL ENGINES**

BEARING THE BRUNT OF WAR ON ALL FRONTS

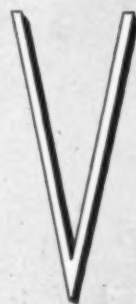


In remote advance bases, on the high seas, in the heat of battle, American made Diesels are being called upon to deliver the utmost of power, availability and durability. In these crucial moments they are showing their mettle. On the home front, in industry, in transportation, Diesels are operating continuously under maximum loads—and meeting the test well.

SATCO® bearings, developed years ago, especially for the severest Diesel service are today contributing to the stamina of these Diesels On All Fronts.

WE ARE INVESTING 10% OF OUR EARNINGS
IN WAR BONDS

*Trade Mark Registered



American Diesels
SATCO® Equipped

Alco
De LaVergne
Enterprise
Fairbanks-Morse
General Motors
Hamilton
Nordberg
Superior
Venn-Severin

AMERICAN BEARING CORPORATION

INDIANAPOLIS



INDIANA



Potash Company of America
Carlsbad, New Mexico
In addition to this new 2400
horsepower unit, this plant
has two 1500 horsepower
engines and one 750 horse-
power, the latter not shown.



A THIRD REPEAT ORDER
All burn natural gas

With the fourth Nordberg Diesel Engine in service at the Carlsbad, New Mexico plant of Potash Company of America, this makes the third repeat order this company has placed with Nordberg in four years. Here is another satisfied Nordberg customer and evidence of the satisfactory performance given by these four engines totalling 6150 horsepower. The first three units were originally arranged to burn fuel oil but have since been changed to burn natural gas. With the Nordberg Dual Fuel Burning Engine it is possible to change quickly from one fuel to the other without change of any major engine parts. Where natural gas is available this engine offers outstanding advantages. It is the most efficient gas burning engine available today. Write for Bulletin 106



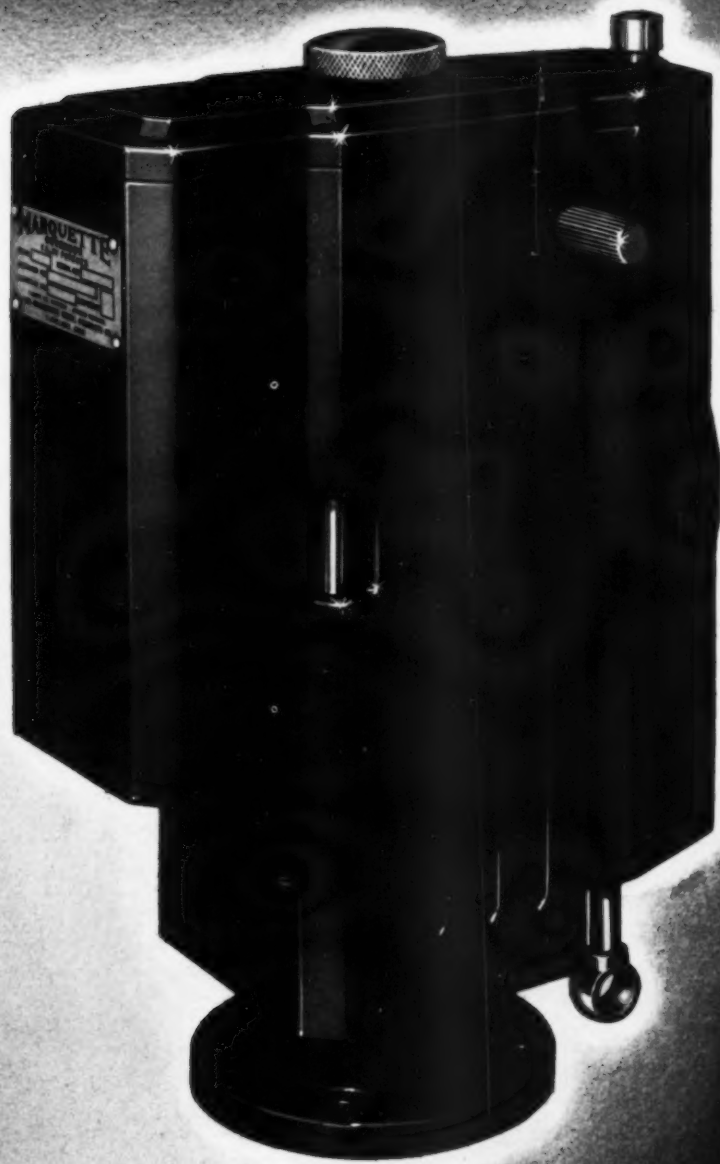
We are proud to serve our
country and to have been
awarded the Navy "E" for
EXCELLENCE in production.

NORDBERG MFG. CO. • MILWAUKEE



NORDBERG
DIESEL ENGINES





HYDRAULIC
SOCHRONOUS
GOVERNORS

The Marquette

METAL PRODUCTS CO.
1145 Galewood Dr. • Cleveland, O.



At its best . . . when the going is

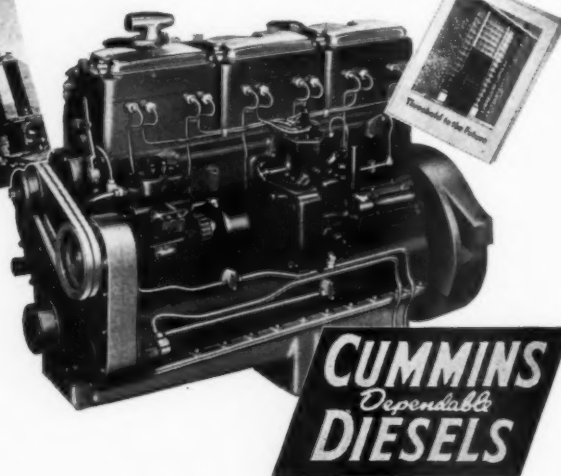
Tough

The first Cummins high-speed Diesel was offered to the public in 1932. From that day to this, the Cummins Diesel has never asked for the easy jobs . . . but has consistently proved itself in the face of the longest odds . . . on the toughest, the longest and the hardest pulls . . . on the jobs which demand the delivery of an engine's full rated horsepower day after day.

Now, after a decade of conditioning, the Cummins Diesel is ready for action—is in action—on every front in this global war. Its quick starting has been tested in the sub-zero arctic cold. Its cool running has been demonstrated in flaming desert heat. Its simple, easy service and maintenance has been proved in the world's most inaccessible, out-of-the-way places.

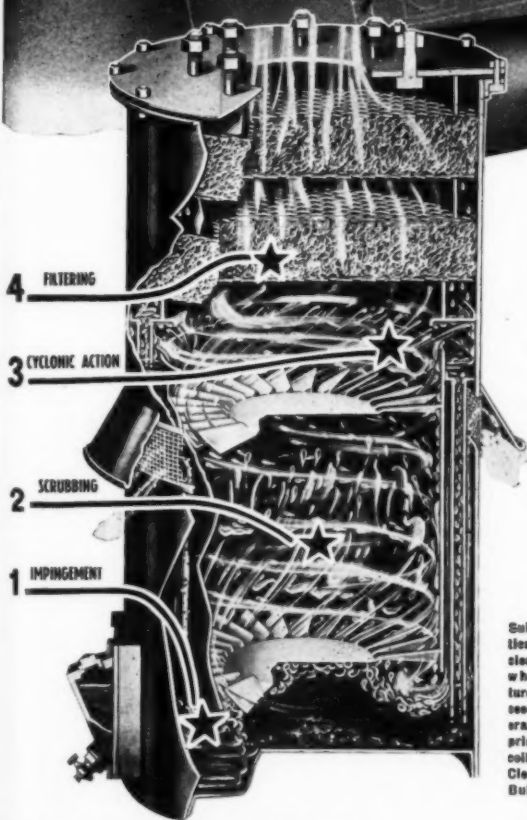
In short, the Cummins Diesel has proved its ability to uphold the highest American tradition . . . to do its best job when the going is toughest. CUMMINS ENGINE COMPANY, Columbus, Indiana.

Out of the experiences of owners during the past 10 years—plus new tests which the engine is meeting daily—a newer and better Cummins Diesel is now building . . . one which will do your job at a lower cost, for a longer time, with fewer parts replacements and service requirements. When all-over economy again becomes the yardstick of value, this new Cummins Diesel will be your first choice. The new booklet, "Threshold to the Future" will tell you why. Ask for your copy.



Don't Overlook the Importance of the RIGHT AIR FILTERS!

*OK with
Cycloil*



CARE WILL SAVE YOUR ENGINES AND COMPRESSORS

It pays to protect the precious machinery and power plants that make possible the production of arms and equipment for our fighting forces. Production schedules accelerated many times normal, have doubled or trebled the running time of gas engines, diesels and compressors in use throughout the nation, which means that clean air is more vital to their operation today than at any previous time. AAF offers a complete line of air cleaning equipment for engine and compressor service. Write for free descriptive bulletins. There's no obligation.

AMERICAN AIR FILTER CO. INC.
INCORPORATED

408 Central Ave., Louisville, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

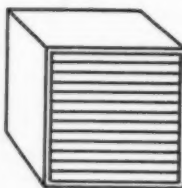
CYCLOIL GAS CLEANER

Suitable for practically every gas cleaning problem when temperatures do not exceed 140°F. Operates on same principle as Cycloil Oil Bath Air Cleaner. Ask for Bulletin 130D.



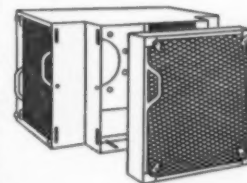
TYPE PL-H FILTER

is a complete assembly consisting of housing, ready to bolt to intake pipe, and dry cell type filters in which wool felt constitutes the filter medium. Ask for Bulletin 120D.



TYPE OCH FILTER

Complete assembly consisting of washable viscous impingement type filters, 1, 2, 3 or more cells are used, depending upon size of cleaning job. Ask for Bulletin 120D.



Write for Cycloil Bulletin No. 130D which gives complete information on the operation of the Cycloil.

AMERICAN

Cycloil

AIR and GAS CLEANERS

CAST FOR A LEADING ROLE IN INDUSTRY

Finishing operations include die straightening in hydraulic presses.



ArmaSteel* Is Right When It Gets to You

There's no room for misfits¹ in the daily shipments of ArmaSteel castings that leave our foundry for varied assignments in industry. Long before the finishing operations are performed, any defective castings will have fallen by the wayside under a barrage of checks and tests—magnafixing, deep-etching, chemical analysis, electric-resistance tests, and others.

While flaws are few and far between, it

is important that what rejections there are should take place in our plant, not yours. Your only concern is to take full advantage of the savings in machining time and tool wear that ArmaSteel castings effect in your manufacturing operations. ArmaSteel replaces critical materials and improves the performance characteristics of vital parts in a variety of applications.

Write for information.

TYPICAL APPLICATIONS

Diesel pistons for heavy-duty locomotives... Automotive piston rings, camshafts, Hydra-Matic transmission gears, drive-shaft universal yokes, clutch throwout collars, valve rocker arms... Refrigerator crankshafts and connecting rods... Washing machine drive gears.

Saginaw Malleable Iron Division

General Motors Corporation, Saginaw, Michigan




*Reg. U. S. Pat. Off.

CAST FOR A LEADING ROLE IN INDUSTRY


**The Most Dramatic Boats of 1942
Had One Thing in Common —**

More **POWER
PER POUND OF
ENGINE WEIGHT**


GRAY
MARINE
MOTORS
GASOLINE
DIESEL



U. S. Navy Landing Boats built by Richardson, at trials on the Niagara River. These capable boats ride higher and get there quicker because they are not slowed down by useless weight. Nothing but the best for the U. S. Armed Forces.



Savings in engine size were extremely important in the Navy's crack Lighters. The compactness of Gray Marine Diesels saved valuable space.

Fast boats are always responsive to weight reduction. Left, one of the 60-footers with twin Gray Diesel Sixes, built by Chris Craft for the Army. These fast functional boats take fullest advantage of the weight reduction that has opened up new possibilities for Naval Architects and improved the performance of Work Boats and Yachts alike.

"THE MAIL CARRIER OF HELL'S CANYON"

Kyle McGrady knew what he was doing when he selected a pair of 3-cylinder Gray Marine Diesels to buck the rapids of the Upper Snake River. Less weight is important here, too.



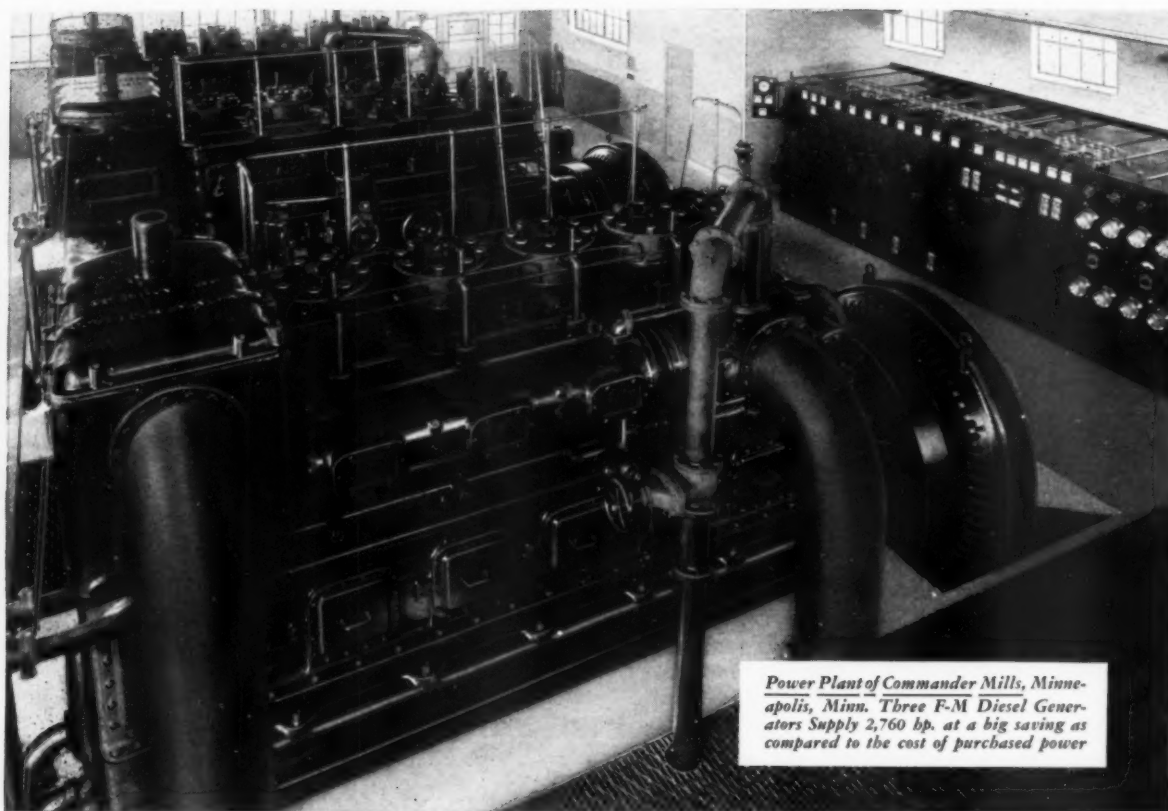
★ ★ ★ ★ ★ ★ ★ ★ ★ ★

GRAY MARINE MOTOR COMPANY

Marine Engine Specialists—Gasoline and Diesel

DETROIT, MICH., U. S. A.

F-M Diesels Save COMMANDER MILLS \$23,357 Yearly!



Power Plant of Commander Mills, Minneapolis, Minn. Three F-M Diesel Generators Supply 2,760 hp. at a big saving as compared to the cost of purchased power

Because the cost of power can so easily mean a difference between profit and loss in producing flour, Commander Mills of Minneapolis, Minnesota, generate their own with Fairbanks-Morse Diesel Generating units.

In a typical year, these Diesel-generators saved the Commander Mills \$23,357 as compared to accurately estimated cost of purchased power for the same period.

There is no such thing as peak war production without dependable, uninterrupted flow of power. And while cost may be secondary to getting the job done in these wartimes, there will come a day when power cost *will* be a major consideration.

Use your priority to meet both today's and tomorrow's power requirements with F-M Diesels. Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Illinois.

FAIRBANKS-MORSE

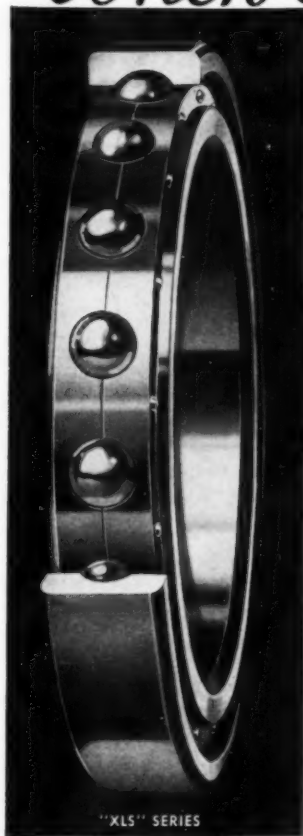


DIESELS
MOTORS
SCALES
PUMPS

★

When You're Cramped for Space

USE THESE VERY LIGHT INCH SERIES BEARINGS



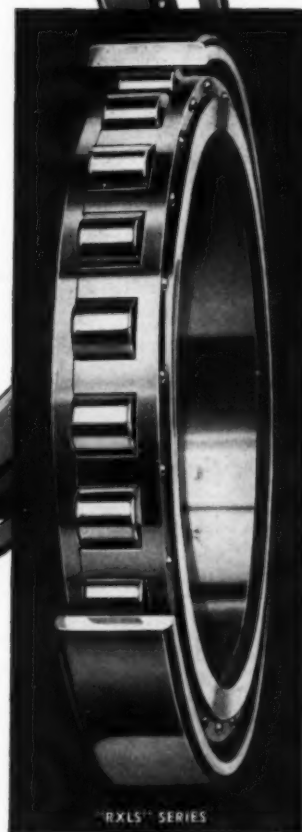
HAVING bores abnormally large, as compared with the outside diameter, they offer definite advantages under certain conditions found in machine design. You may have them in several different types, *affording compactness, light weight, and greater latitude in your design.*

There are several lines of very light type ball bearings, which include the "S" starting at $\frac{1}{8}$ " bore, and the "XLS" starting at $1\frac{1}{8}$ " bore, running up to a maximum of 21" bore and 28" outside diameter. And in very light type roller bearings, there is the "RXLS" Series, paralleling the "XLS" in size range.

Why not let our engineers tell you more about these Very Light Precision Bearings? Write for the Catalog.

NORMA-HOFFMANN

PRECISION BALL, ROLLER AND THRUST BEARINGS



NORMA-HOFFMANN BEARINGS CORP'N.—STAMFORD, CONN., U. S. A.



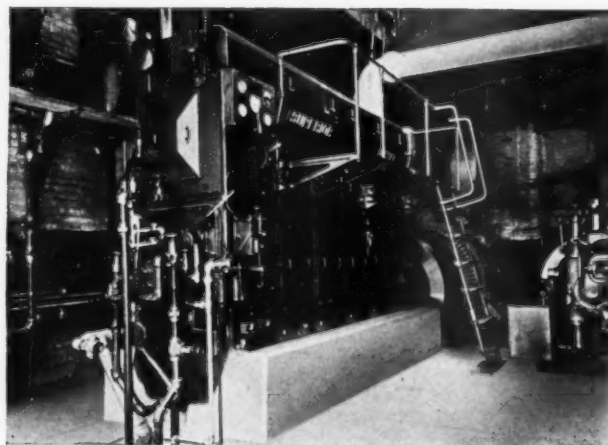
Factory Building of the Stow-Davis Furniture Company,
Grand Rapids, Michigan

**IN
LESS
THAN
3
YEARS**

...The Superior Diesel Generator Set installed in the power plant of the Stow-Davis Furniture Company of Grand Rapids, Mich., HAS PAID FOR ITSELF BY SAVINGS IN POWER COSTS. Total operating expense averages less than one cent per K.W.H.; 11.2 K.W.H. are generated per gallon of fuel oil; repair costs have totalled \$34.85 since the engine was installed.

Here is another example, added to many others, of Superior's outstanding ability to transform the engine room from an expensive liability to a dividend-paying asset.

**For low-cost
dependable power
INVESTIGATE
SUPERIOR DIESELS**



The 315 H. P. 12½" x 15", Superior Diesel
which paid for itself in less than three years

SUPERIOR ENGINE DIVISION...THE NATIONAL SUPPLY COMPANY

SALES OFFICES: Springfield, Ohio; Philadelphia, Penna.; New York, N. Y.; Los Angeles, Calif.; Jacksonville, Fla.; Houston, Texas; Chicago, Ill.; Fort Worth, Texas; Tulsa, Okla.; Boston, Mass. FACTORY: Springfield, Ohio

... for that extra "Drive"



In again
Out again

... with the original rings!

A freighter plying between the States and Australia regularly carried 150% spare rings for its Diesels, because of the high rate of replacements required. Fifty pounds of compression was ordinarily lost in the first ten days out. There was always the danger of both engines shutting down at once . . . which would have meant almost inevitable loss of the ship.

Then American Hammered Piston Rings were installed. Back in port, after a trouble-free round trip, the engines were torn down and inspected. *The same rings were re-installed*, and the freighter dispatched on its next voyage.

In the Liberty Ship program, American Hammered Piston Rings were supplied to eleven different engine builders, and installed in half the vessels launched.

American Hammered Piston Rings are the result of "know-how" accumulated during 25 busy peace-time years. The research laboratories, the foundry, the shop, the inspection divisions, and the service department are headed and staffed by men who have devoted years of full-time effort to solving the toughest ring problems. Where equipment must have that extra "Drive" that only rings with extra "Drive" can give, you'll generally find American Hammered Piston Rings on the job. Koppers Company, American Hammered Piston Ring Division, Baltimore, Maryland.

American Hammered
Piston Rings

a K O P P E R S product



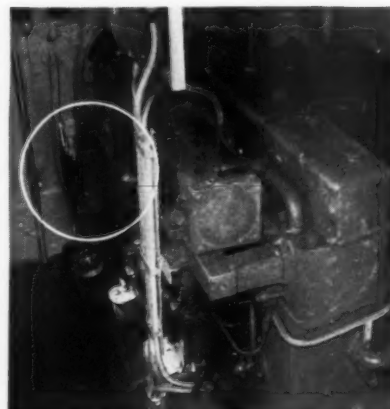
PIERCE PROTECTS ENGINES ON ARMY TUGS

● The sturdy Buda power plants on army tugs rely on Pierce Flyball Governors for protection against destructive overspeed, and for automatic regulation to provide exactly the power needed for any load condition.

Pierce Governors respond instantly to any change in load, regulating accurately, positively—without fail. And Pierce's precision and care in manufacture assure dependable performance and service life—usually longer than the engine itself.

Pierce engineers have been leaders in working out governor problems. Today, in solving governor problems of war equipment, they are building a vast new store of experience that will make possible even closer regulation at lower cost in commercial governors after the war. In the meantime, Pierce engineers will be glad to consult with you on your governor problems.

THE PIERCE GOVERNOR COMPANY
1603 OHIO AVENUE, ANDERSON, INDIANA



The "Major George W. Armitage" (shown at top of page) was purchased by the Quartermaster Corps of the U. S. Army. It is powered by a Buda Diesel engine (above) that is governed by a Pierce Flyball Governor.

STANDARD EQUIPMENT ON MANY OF THE WORLD'S LEADING ENGINES

Pierce Governors
STANDARD SINCE 1913



Speaking of Long
Production Lines...

BARDCO's
extends all the way
from foundry to
final assembly



THIS WAS

Our War Job

... To combine, expand, and coordinate existing and new Bardco production facilities into one of the nation's major organizations manufacturing stand-by and constant-duty electric generating plants. *Objective achieved:* Large scale production of generating plants exclusively for the U. S. Government and America's vital war industries.

Future benefits: Cheaper, more dependable electric power for ALL business and industry.

Both today's contribution to victory and tomorrow's contribution to peacetime progress spring from Bardco's control of quality all along the production line—from castings to final assembly. We have our own foundry, our own machine shops, completely produce our own generators, build our own voltage regulators and switch-gear... which materially contributes to a smooth and continuous production line. Here is TRULY a production line... in an extent and completeness that is not matched in similar manufacturing.

This is why Uncle Sam BANKS ON BARDCO... and why the private user of electric power can BANK ON BARDCO when this war is won.

Emergency Stand-By and Constant Duty Generating Plants;
one to 200 KW for single or multiple installations;
Diesel, gasoline or natural gas engine driven.



BARDCO

MANUFACTURING & SALES COMPANY

LOS ANGELES • CALIFORNIA

DAYTON • OHIO

WASHINGTON • D.C.

TORONTO • CANADA

Air Bases and Military Highways



★Air bases; runways, taxi strips and aprons for flying-fields; docks; access roads; military highways — are urgently needed for our armed forces everywhere.

And that takes aggregate—tons and tons of it!

To supply it *quickly*, Uncle Sam is getting the current production of these portable Pioneer crushing-screening plants—many of them with Waukesha Super-Duty Power Units.

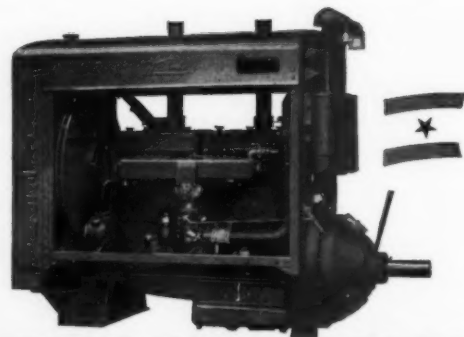
Contractor Harry Pickett gets real output—100 to 110 cu. yds. of minus $\frac{3}{4}$ " per hr. consistently with his portable Pioneer plant. Its Waukesha Oil Engine Power

Unit drives the 1036 jaw crusher, 3018 roll crusher, 3'x10' $3\frac{1}{2}$ -deck vibrating screen and conveyors smoothly and effortlessly—with plenty of power in reserve for emergencies.

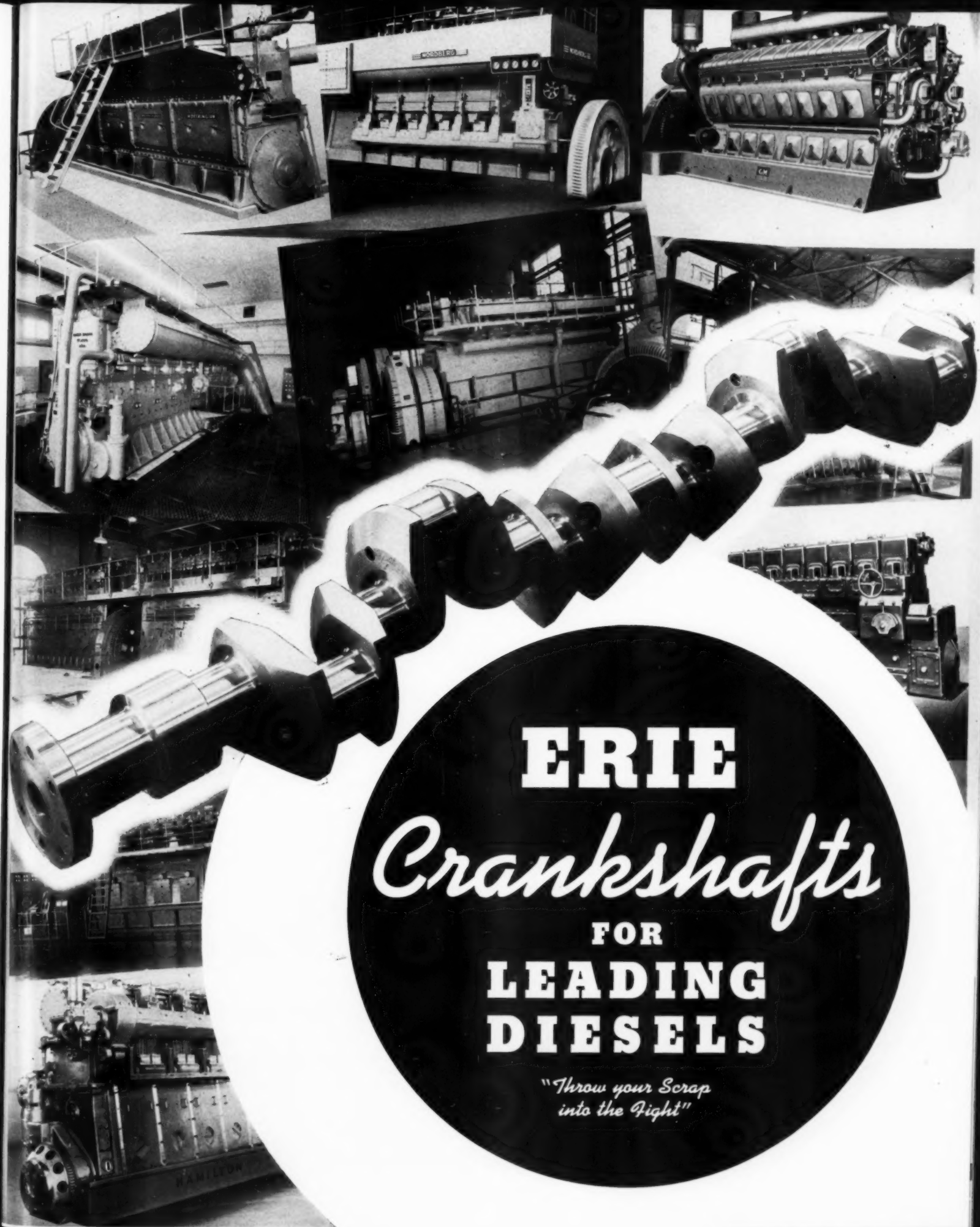
In addition to large capacity, the Waukesha Engine, with its moderate weight, gives the plant extra portability.

And by users' performance records, Waukesha Engines give the *greatest overall economy*. Get Bulletin 1079.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK TULSA LOS ANGELES

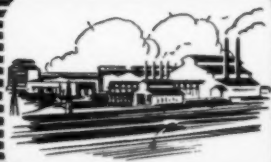


WAUKESHA ENGINES

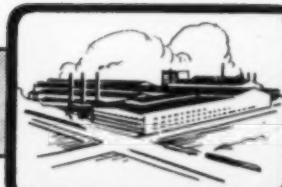


ERIE
Crankshafts
FOR
LEADING
DIESELS

*"Throw your Scrap
into the Fight"*

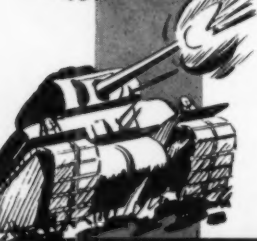
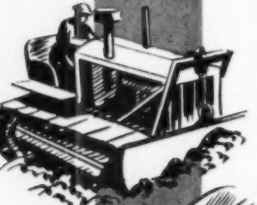
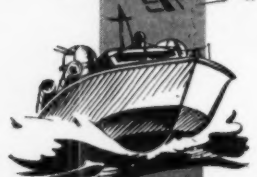


ERIE FORGE COMPANY, ERIE, PA.





HEMPHILL PREPAREDNESS- *helps win the war with* **DIESELS**



★ The huge and rapid expansion of Uncle Sam's war plans demand the immediate and continuous services of great numbers of Diesel engine operators and mechanics. To assist the Army and Navy in meeting this requirement for specialists, Hemphill Diesel Schools are training thousands of Service Men. Such an assignment was not entirely new to Hemphill. For many years our schools have been staffed and equipped to do a BIG job—an experienced job—in the Diesel training field—and facilities and Hemphill personnel have always kept abreast of Diesel progress. When Uncle Sam said "Let's go" we were ready.

Soon after our nation started mobilizing, many U. S. Army men were sent to our Chicago school for training. Now the Navy has taken over the entire facilities of the Chicago school. Army men are at the Memphis school... and the Los Angeles school moved into even larger quarters to accommodate a Navy training program. The New York school has trained men from the Navy... and is now conducting the Diesel training of Coast Guard personnel.

This unmistakable evidence of the importance of Diesel power and Diesel-trained men in fighting this war justifies the foresight and vision we put into the operation of the Hemphill Diesel schools. We knew... and you in the industry knew... the Diesel's important role in peacetime progress, and now we know its vital wartime role. It is fortunate that so many civilians were equipped with Hemphill Diesel training because they are now filling important posts in the four corners of the earth... and even more fortunate that Hemphill Diesel schools have the extensive facilities so urgently needed by our Army and Navy at this time.

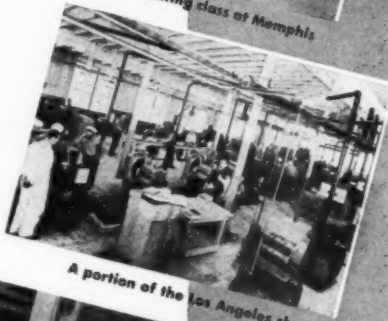
Contractor to the U. S. Army and U. S. Navy



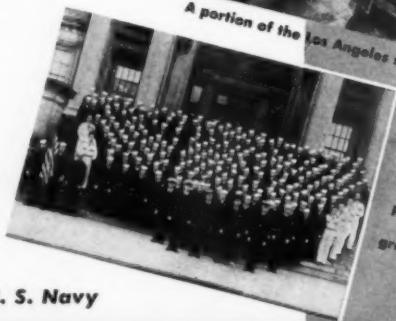
Shop training in Chicago



Graduating class at Memphis



A portion of the Los Angeles shops



Typical New York school graduation

HEMPHILL INSTITUTE OF TECHNOLOGY

Operating the Hemphill Diesel Schools at

NEW YORK
3128 Queens Blvd.
Long Island City

CHICAGO
515 So. Western Ave.

LOS ANGELES
1601 So. Western Ave.

MEMPHIS
421 Monroe Ave.

★ AMERICA'S ORIGINAL EXCLUSIVE DIESEL TRAINING INSTITUTION



Prelude to PEACE

In the Prelude to the Peace for which we strive, the dominant note is the rhythmic hum of coordinated production. Day by day the pitch becomes higher, the beat faster, the sound louder and more inescapable. • In our own plants this sound is unmistakable. There's the vibrant feel of smoothly functioning production in the air. There's the look of it in the eyes of the men. Coordination has everywhere replaced confusion. Confidence has everywhere replaced uncertainty. There's Victory in the air. And Victory is the Prelude to Peace.

GENERAL MACHINERY CORPORATION

HAMILTON, OHIO

THE NILES TOOL WORKS CO.

THE HOOVEN, OWENS, RENTSCHLER CO.

GENERAL MACHINERY ORDNANCE CORPORATION

Keep Engines Running at Maximum Output—with Minimum Trouble

The chips are down. American industry faces its most crucial test. Production facilities are strained to the utmost as governmental and civilian orders pile up. Equipment must be at peak efficiency. Be sure all compressors, pumps and internal combustion engines are equipped for maximum output, minimum maintenance.

Equip each one NOW with Protectomotor Intake Filters. Stop trouble where it frequently starts—in abrasive dust that wears reciprocating parts and clogs valves, reducing production as it increases chances for trouble. Keep 'em running, America—equip with Protectomotors NOW!



WRITE FOR CATALOG describing filters for engines, pipe lines, ventilation, etc.

STAYNEW FILTER CORP.

"Air Filter Headquarters"

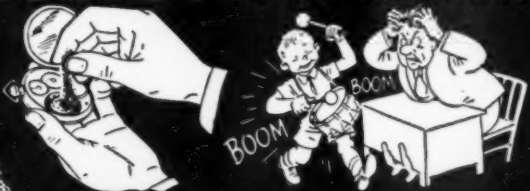
12 Centre Park,

Rochester, N. Y.

PROTECTOMOTOR
99% EFFICIENCY
AIR FILTERS

NEW

MODEL DS SILENCES, FILTERS AIR TO ENGINE INTAKE



You wouldn't permit this... or this...

WHY LET UNPROTECTED INTAKES DRAW IN DUST... CAUSE EXCESSIVE NOISE?

The Model DS Protectomotor is the only device that not only prevents the intake of dust to air-breathing machines, but also silences the intake sound.

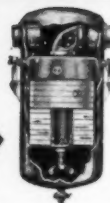
Construction is simple, rugged and effective, possessing many exclusive, patented features and special advantages:

- A. Series of cylindrical rectifying chambers of scientific diameter to length ratio which smooths out sound waves.
- B. Dry Feltex Filtering Medium more than 99% efficient by University of California Laboratory tests.
- C. Radial Fin Construction. Permits large area of filtering medium to occupy smallest possible space.
- D. Rigid, galvanized mesh frame.
- E. Reinforcing tube. The Model DS Protectomotor is "built like a battleship."

AIR, GAS & LIQUID LINE FILTER

Exclusive Radial Fin Construction provides large filtering area in relation to space required. Thousands used in industry since 1920.

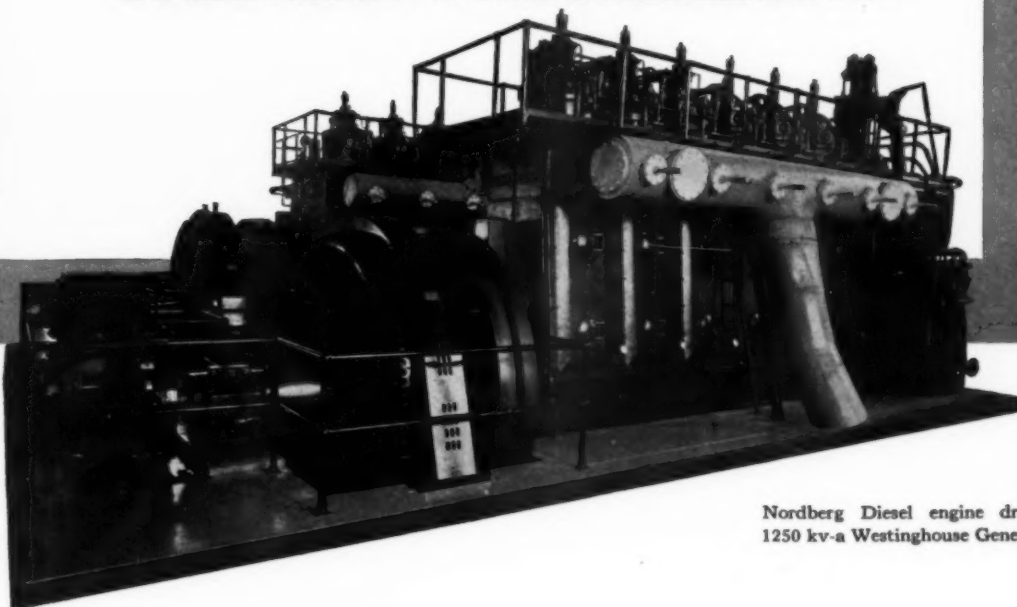
Staynew Representatives in Principal Cities



SLIGHTEST TRACES OF OIL REMOVED FROM AIR TRANSMISSION LINES WITH LATEST PROTECTOMOTOR, MODEL AAPHS PIPE LINE FILTER. Staynew engineers have designed an entirely new type of pipe line filter, now used extensively for the protection of delicate air-powered control devices. This new filter, the Model AAPHS, prevents the passage of the most minute traces of vaporized oil. The AAPHS is actually a "super" filter, used on most applications as the final of two or more stages of filtration.

Construction Features: (1) Inlet; (2) baffle; (3) solid Feltex Disc through which all air must pass; (4) carrier tube; (5) outlet; (6) shell; (7) drain cock.

For Maximum Generator Performance...



Nordberg Diesel engine driving
1250 kv-a Westinghouse Generator

... specify Westinghouse ... it's tailor-made for your Diesel!



Design, construction, materials and craftsmanship—that's why the Westinghouse A-C Generator has been a leader for 56 years in converting mechanical power into electrical power.

To these important factors Westinghouse has added "matched design" to insure the maximum performance of each A-C generator. Now your Diesel and generator function as a single unit—for now your generator is tailor-made to fit the individual characteristics of your engine.

But Westinghouse accepts even more respon-

sibility—the responsibility for providing the complete electrical installation. It's far more effective to combine Westinghouse auxiliary units—exciters, motors, regulators and switchboards to meet the needs of Diesel engine plants—for these units are already co-ordinated in design. Such a plant costs nothing extra and you deal with one responsible firm.

Don't overlook these plus values. Specify "Westinghouse" for the entire electrical installation. Write for Booklet B-3028 containing complete information. Address Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

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FOR DIESEL ENGINE DRIVES

Westinghouse

A-C GENERATORS



Volume Seven of the DIESEL ENGINE CATALOG is now available. Completely revised, this book contains the description and detailed specifications of One Hundred and Fifty-Four engines. Nothing like it published. The most useful Diesel book available, containing as it does a complete cross section of this rapidly expanding industry, insofar as the engines available are concerned. Your name imprinted on front cover for 50c additional, if you so order.

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described and
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NEW - BIGGER - BETTER**

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Chicago Pneumatic Model 8-CP, and 9-CP	Lorimer Diesels
Chicago Pneumatic Type 16-CP	Mack-Lanova Diesels
Chicago Pneumatic Type RHB-50	Menasco Diesels
Clark Bros. Diesels	Murphy Diesels
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Cooper-Bessemer Type EN & GN	Nordberg 2-cycle Diesels
Cooper-Bessemer Type LS Marine	Nordberg Gas-Diesels
Cummins Diesels	Palmer Bros. Diesels
De La Vergne Type VA	Rathbun-Jones Diesels
De La Vergne Model VB	Rathbun-Jones Gas Engines
De La Vergne Model VG	John Reiner Marine Units
De La Vergne Model VM	Sheppard Diesels
De La Vergne Gas Engines	Superior Model "A"
De La Vergne Model VO	Superior Model "D"
Dodge Diesels	Superior Type M
Enterprise Diesels	Superior Type S
Fairbanks-Morse 33 and 37	Union Diesels
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Fairbanks-Morse 42	Venn-Severin Models HC and M
Fairbanks-Morse 32 and 35	Washington Iron Works Diesels
Fairbanks-Morse Model 38	Waukesha-Hesselman Type
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Unfailing Power Forges Speedier Victory



Continuous operation . . . no breakdowns
. . . 13% saving in lubricant cost . . . with
SOLNUS OILS

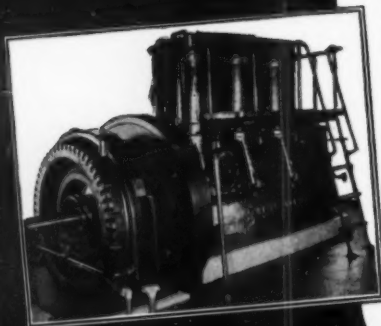
Massive forgings for fighting ships . . . smaller forgings for arms for America and the uninterrupted production of them depend on the "power heart" of this forging plant — the diesel engines.

Seven large diesel engines supply the power to speed this victory production. Three of them have been in operation for 16 years on a 24 hour basis and lubricated with Sun Diesel Oils. Today these same engines are operating with original cylinders, the walls of which have never been rebored and there has never been a breakdown due to faulty lubrication. That's a typical record set with Sun Solnus Oils — the modern diesel lubricants de-

veloped to give long hours of uninterrupted operation.

Long liner life . . . no hard carbon . . . freedom from stuck rings . . . economical operation, that's what Sun Oil Engineers — those Doctors of Industry — are providing can be achieved. These skilled technical men are ready, willing and able to help you step-up the operating efficiency of your diesels and the products they have to offer have been developed to maintain that improved efficiency. For proof of what Sun Service can accomplish write for "Helping Industry Help America."

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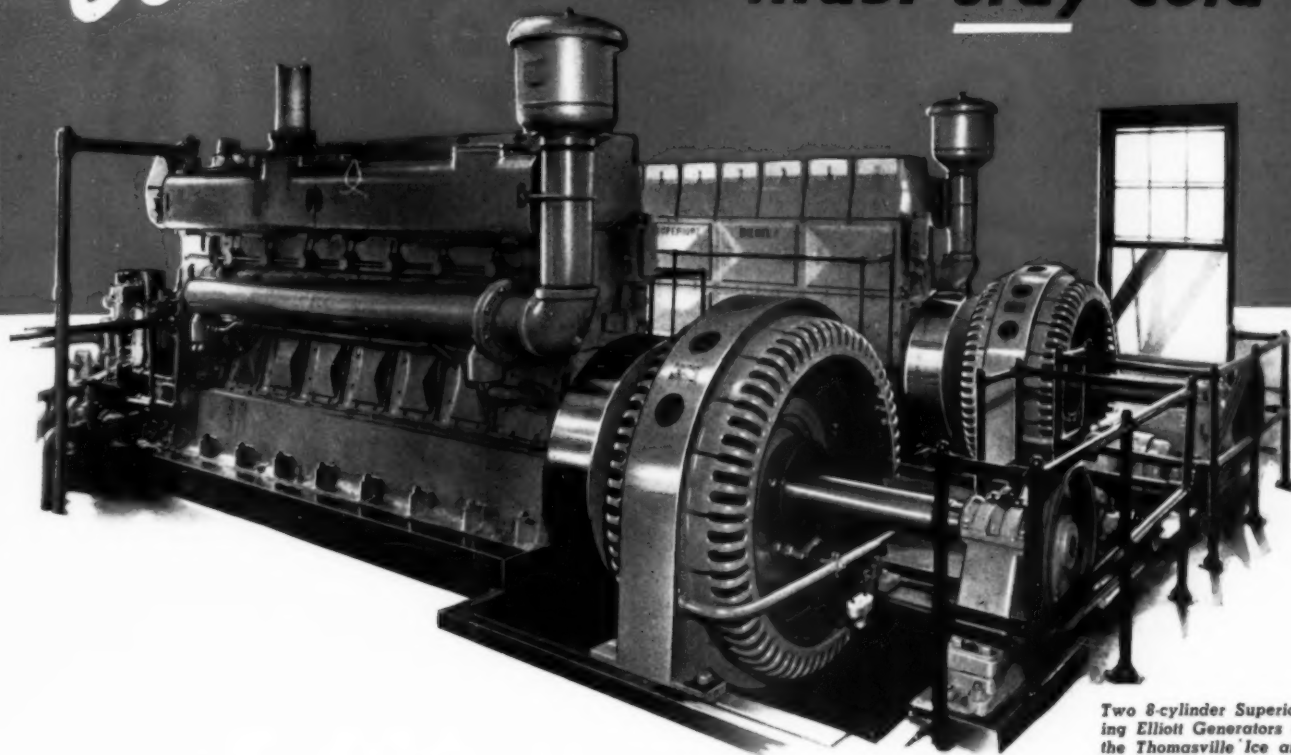


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SUN PETROLEUM PRODUCTS.. HELPING INDUSTRY HELP AMERICA

COLD STORAGE

must stay cold —



THIS GEORGIA PLANT MAKES SURE OF IT

Two 8-cylinder Superior Diesels driving Elliott Generators at the plant of the Thomasville Ice and Manufacturing Co., Thomasville, Ga. The generators are 200-kw., 80 per cent power factor, 3-phase, 60-cycle, 2300-volt, with V-belt-driven exciters.

by installing full power standby equipment. *Two* Diesel engines, each driving an Elliott generator, insure non-stop refrigeration for the Thomasville (Georgia) Ice and Manufacturing Co.

This is a "show" plant—everything spick and span, clean, well-kept and well-lighted. It properly occupies an important place in the business life of the community, preserving the appearance and quality of certain agricultural products, particularly pecans and brined okra.

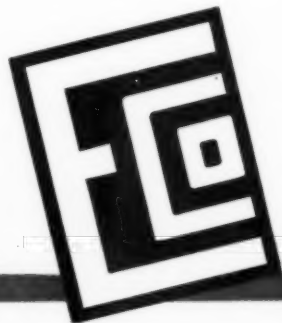
These products are as good as money in the bank, and dependable cold storage facilities maintain this value.

When you come upon a generating plant in which the community takes pardonable pride, you are quite likely to find the familiar Elliott monogram somewhere on the generating end.

ELLIOTT COMPANY

Electric Power Dept., Ridgway, Pa.

District Offices in Principal Cities



ELLIOTT GENERATORS

BUILT FOR THE DIESELS THEY WORK WITH



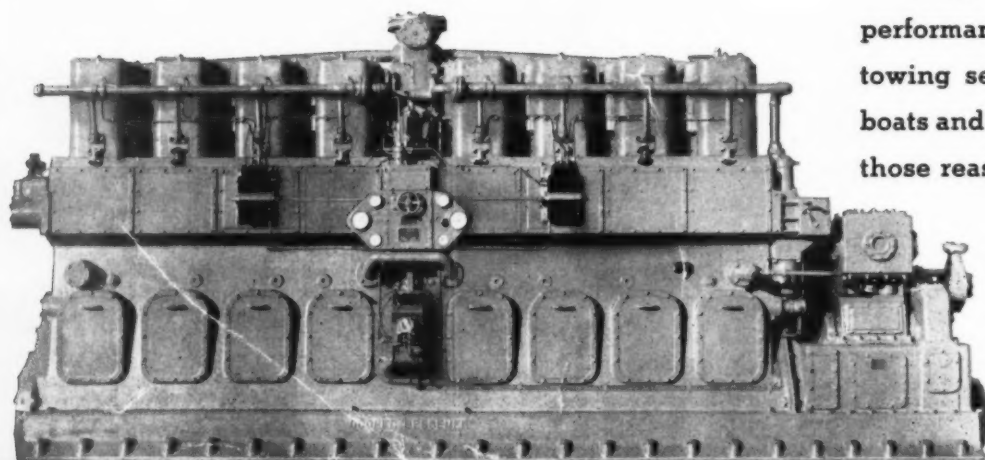
All "AMERICAN" towboats with all-American Diesels!

The new towboat JEFFERSON joins her sisterships PATRIOT and PROGRESS . . . all owned by American Barge Lines Company, all with good American names, and each powered with the all-American of marine engines — Cooper-Bessemer Diesels!



The JEFFERSON takes her place as one of three of the most powerful towboats on our rivers . . . hard-working and fast-pushing. Two Cooper-Bessemer Type LS Diesels, rated 1,000 horsepower each, drive her twin screws. They were chosen upon past performance of Cooper-Bessemer Diesels in her sisterships.

There are reasons for the outstanding performance of Type LS Diesels in marine towing service, cargo vessels, large fishing-boats and ocean going tugs. You should know those reasons . . . Write for Bulletin LS.



Left: Operating side of eight cylinder Type LS engine.

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